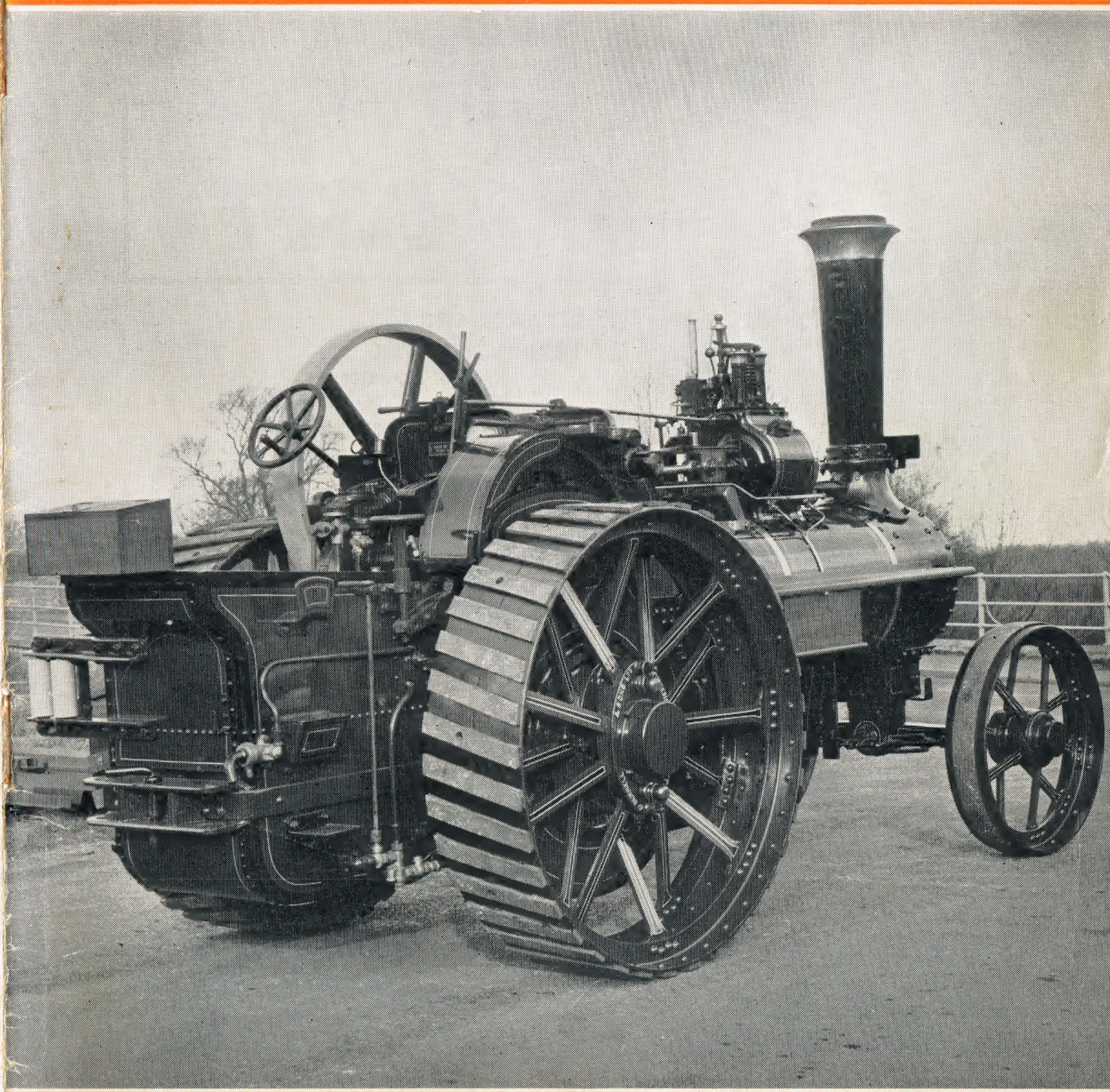
Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED



ONE SHILLING 10 OCTOBER 1957 VOL 117 NO 2942

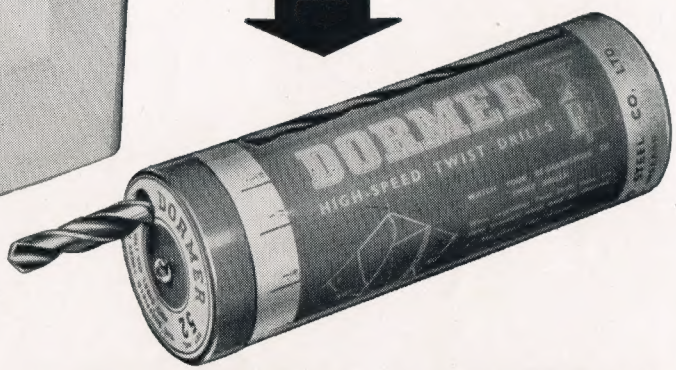
Keen modelmakers need

DORMER

DRILL SETS

Nº 9 CARBON STEEL
Nº 10 HIGH SPEED STEEL
STRAIGHT SHANK DRILLS
SIZES : 1/16" TO 3/16" BY 64THS
AND 7/32", 1/4"

Nº 52 HIGH SPEED STEEL
Nº 53 CARBON STEEL
STRAIGHT SHANK DRILLS
SIZES : 1/16" TO 9/32" BY 32NDS



OTHER POPULAR SETS ARE ALSO AVAILABLE

THE SHEFFIELD TWIST DRILL AND STEEL COMPANY LIMITED
SHEFFIELD ENGLAND

DORMER DRILL SETS ARE OBTAINABLE FROM YOUR USUAL ENGINEERS' MERCHANTS

NOVEMBER ISSUE—Out Friday Oct. 18

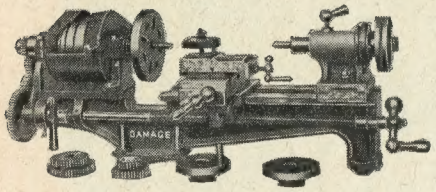
HOME
MECHANICS
The MAKE-it-yourself Magazine
CONTENTS
All designs are proved and tested and a list of simple materials needed, with an estimate of the cost, is given in each case.
Portable Kitchen Units. A new series on the building of kitchen units which can be temporarily installed into furnished premises.
Log Cabin Cigarette Box. A miniature log cabin standing in a fenced enclosure. A cigarette appears when the roof is raised.
Renovating an Old Fashioned Music Box.
Penny-farthing Table Lamp.
Snack Table. Equipped with four pivot arms which swing out to provide additional resting places for guests' cups and saucers.
Draining Board. Made of wood with aluminium lining for less than 10/-.
Three-tiered Table of modernistic design.
Spring Steel Bows for Archery. Some interesting experiments and conclusions.
Toy Fort made of timber and plywood.
Unusual Bird-like Kite. A toy that flies well and looks like a great bird in the sky.
Extra Room in the Kitchen. Made by reversing the back door to open outwards and then building a hanging glass porch.
How to Use Your Plane. Another article in the series on the use and care of workshop tools.
Also trade products reviewed. Crossword puzzle. Readers queries answered. Ten minute tip, &c.
1'3

ORDER YOUR COPY TODAY

GAMAGES

SPECIAL SCREWCUTTING 3⅝ in. x 16½ in. BACK GEARED

approx. between centres



Brief details: Swing in gap of 3⅝ in. model, 8½ in. 10 change wheels. Equipment includes: Faceplate, Catchplate and Extra Backplate in rough screwed to fit mandrel nose. 16½ in. approx. between centres.

Gamage's Tool and Motor Car Accessory List Free on request

PRECISION LATHE

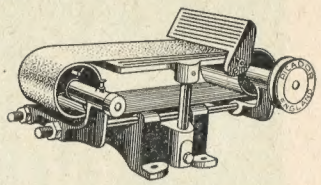
Today's Finest Value!

CASH PRICE **£33**

For only Nine Monthly Payments of 78/10

Carr. & Pkg. 12/9; England or Wales, 21/6, Scotland, Plus 20/- for Crate, returnable.

The NEW BELT SANDING MACHINE



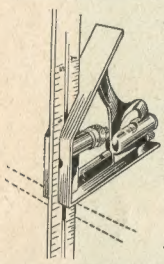
No special skill is necessary

Diameter of driving pulleys 3 in.
Face of driving pulleys 3 in.
Driving pulley 3 in. by ½ in. Vee by ½ in. bore.
Steel spindles running in cast-iron bearings.
Recommended motor pulley 3 in.
Extra belt 30 by 3 in., fine, medium, coarse, 3/- each.
Weight approx. 13-14 lb.

A compact and efficient light duty unit designed to trim small parts. The low power requirements, namely ¼ h.p., proves most advantageous. Max. overall size 14 by 6 in. Table size 8 by 4 in. Adjustable fence.

GAMAGES PRICE **5 gns.** or nine payments of **12/8**

Carr. & Pkg. 7d. outside our extensive van delivery area,.



A TOOL MUCH IN DEMAND

ADJUSTABLE TRY & MITRE SQUARE

New design, lightweight head. Rust resisting finish. Double hair-line level gives a much wider view. Scriber with hardened tip in foot. **12 in. rule** which is graduated on one side by ⅛ths and 1/16ths, and on the reverse with 1/16ths and 1/32nds.

Post & Pkg., 1/- BARGAIN PRICE **7/6**

GAMAGES 1 inch MICROMETER

For accurate measurements from 0.001" to 1.0" Ideal for general handymen, model makers, students, schools, etc. Complete with full instructions. **10/-**

Post & Pkg., 8d.

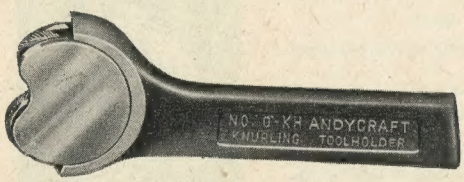
2 in. MICROMETER 14/6. *Post & Pkg.* 10d.

GAMAGES, HOLBORN, LONDON, E.C.1 HOL 8484 **Open Thursdays until 7 p.m.**

IMPROVING YOUR WORKSHOP

In response to many requests a special LEAFLET covering a wide range of modern tooling is available free for a stamped and addressed envelope.

PIVOT HEAD KNURLING TOOL



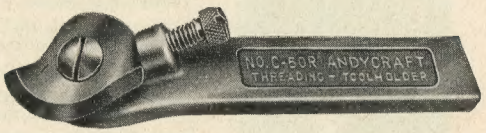
Material EN351 Nickel Chrome Case-hardened Steel to Brinell 620 (Min). Machined top and bottom square to sides with Pivot Head, self-adjusting to line of work. Supplied complete with one pair medium cut knurls. (Extra Knurling Wheels are available in High Speed or Cast Steel; spiral, straight or check in fine medium or coarse cuts—prices on application.)

Code	Size of Holder	Knurls	Price each
1826/CS.	5 7/32" × 13/16" × ⅜"	CAST STEEL	£2.1.6.
1826/HS.	ditto	H.S. STEEL	£2.5.6.

Knurls: ⅝" dia. × 5/16" wide × ¼" cut × ¼" bore.

A UNIVERSAL REVOLVING HEAD TOOL
A new Universal Knurling Tool (Holder: ½" × 1¼" × 6¾") supplied with 3 pairs Knurls, **Code 1923/CS. Cast Steel Knurls, £2.2.0. Code 1923/HS with H.S. Knurls, £2.12.6.** Complete range of extra Knurls available.

EXTERNAL THREADING TOOL



Material EN351 Nickel Chrome Case-hardened Steel to Brinell 620 (Min.) Machined top and bottom square to sides.

The cam form cutter can be positively adjusted to suit centre height and is easily re-sharpened by grinding on the top face of the form. Cutters are in High Speed Steel, carefully hardened and ground. Each holder supplied with one Whitworth Form Cutter.

Code	Height	Width	Length	Price
1848	13/16"	⅜"	4 5/16"	£1.14.6.

EXTRA CUTTERS each:—
Code 1850. Whitworth Form (55 degree). 15/3.
Code 1851/M. Metric U.S.S. Form (60 degree). 17/3.
Code 1851/B. B.A. Form (47 degree). 17/3.

Our 1957 BUYER'S GUIDE is now being delivered in all parts of the world. Write for your copy today—1/6 post free.

T. GARNER & SON LTD

6-8, Primrose Hill, BARNSLEY 'Phone 2908

Model Engineer

ONE SHILLING 10 OCTOBER 1957 VOL 117 NO 2942

Published every Thursday Subscription 58s. 6d. (USA and Canada $8.50) post free

In this issue

501 Smoke Rings
503 Gas engine—7
506 Modifications to EW lathe
509 Beginner's workshop
510 Readers' hints
512 Huddersfield club day
514 Burrell Fearless
515 Traction engine rallies
518 LBSC
521 Swedish railways centenary
522 Unfinished locomotives
523 Readers' queries
524 Unusual locos
526 Spherical turning attachment
528 Postbag
530 Club news

Next week

Hot-air engine
Workshop topics
Notes on American traction engines
Maintenance in miniature
Multi-purpose sawbench
Final instalment of St Ninian

The Editor is pleased to consider contributions for publication in MODEL ENGINEER. Manuscripts should be accompanied by photographs and/or drawings and should have a stamped addressed envelope for their return if unsuitable. None of the contents of MODEL ENGINEER may be reproduced without written permission. All correspondence should be addressed to the Editor, Model Engineer, 19-20 Noel Street, London, W1.

Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

THE fate of partly-finished engines which have been left to moulder on the workshop shelves finally to be jubilantly resurrected after several years hibernation is a common story in the pages of Postbag. In fact our new contributor R. M. Evans writes of this on page 522.

But from Ripon, in Yorkshire, comes the sad story told by Mr S. Addison of three engines he started but was never permitted to finish.

The first was an Atlantic which he began in 1924 but which, in the domestic upheaval of spring cleaning —and we married modellers know what that implies—was unceremoniously cast aside. Second, *Small Bass*, was started in 1928. That was stolen.

Miss Ten to Eight was conceived in 1938, but her birth was too near the war era. She never passed the weaning stage, being blown up, along with several hundred copies of MODEL ENGINEER, a year or two after her conception.

The world over

The international circulation of ME, which still continues to surprise many readers, once proved very helpful to Mr Addison.

A regular reader for over 50 years —it was the description of *Little Giant*, the 15 in. gauge locomotive, that won him to the MODEL ENGINEER fold in 1906—he wondered how he would fare for his copies when he embarked on a world tour. But he had no need to worry, for, to his astonishment, he was able to secure MEs in Ireland, Egypt, South Africa, Australia, New Zealand and Canada.

So if any of you are thinking of a long lazy cruise next summer—not to worry; you'll probably find a copy of the ubiquitous ME on the bookstall of the liner.

The premier award

NOW that the hue and cry of the Model Engineer Exhibition has died down there is much discussion about various aspects of it. One which I found very interesting was on the conditions which govern entries to the Duke of Edinburgh trophy.

This is the premier award of the Exhibition and is open to models which have won championship cups or gold, silver or bronze medals in earlier exhibitions. One prominent exhibitor with whom I discussed the matter held very strong views that the judge's order of merit for the models should be published, or at least there should be 1-2-3 markings in the class.

As there is one prize only, I think he has a good point and I can assure him that it will certainly be considered for next year.

Incidentally, I have spoken about this class to several judges and they are all agreed that this competition is by far the most difficult to judge. The models are all different types, widely differing in the amount of work done on them and it is not easy

Smoke Rings . . .

to establish a common yardstick by which they can be compared.

By the lack of criticism I have heard of the judges' decisions, I must say that they seem to have managed very well.

Railway stamps

THE pictorial value of railways has long been exploited by stamp designers and curiously enough by almost every country except the one which invented both the postage stamp and the locomotive—Britain.

Why the Post Office should be so conservative in their choice of design is a mystery. Perhaps it's their stuffy way of preserving our insularity.

However, yet another country, Sweden, has introduced a railway motif into its postage, the three

Three of the stamps which Sweden has issued to commemorate the centenary of her State Railways

examples illustrated on this page depicting the hundred years' progress of the iron road in the land of the matchstick.

On page 521 is a page of pictures of the Swedish State Railways centenary exhibition kindly sent to us by a Stockholm teenager, Mats A. Hede.

Gadget workshop ?

THE many articles which are published in ME on the design and construction of articles for the workshop, and attachments for machine tools in particular, are all practical and useful; their popularity among all classes of readers is a proof that they fulfil a definite purpose in extending and improving the scope of the modest equipment available to the amateur craftsman.

" Gadgetry," as it is often termed, has become practically an end in itself to some of its devotees, and there can be no objection to this so long as it satisfies the persons concerned; the design and construction of tools can be just as interesting as any other mechanical pursuit.

There is, however, a danger that gadgetry may get out of hand in some cases. Like many other useful things, these gadgets are good servants but bad masters, and if the intention is to make practical use of them for anything other than making more gadgets, it is necessary to observe some kind of economic balance between the task of making them and the extent to which they are likely to be employed. If it takes forty or fifty hours to make a device which is only likely to be used for ten minutes or so in the course of a year, one may seriously question whether it is worth while !

Fallacy

One aspect of the gadget question which has been brought to my notice on several occasions recently is that some newcomers to model engineering, seeing all the various devices described in ME, have been inclined to regard them as necessities rather than refinements. Some prospective beginners may be deterred by the idea that normal model work is difficult or impossible without the aid of extra items to standard tool equipment. Readers of more mature experience know that this idea is fallacious, and that some of the best models have been made with the simplest and most austere equipment; it is most important that newcomers, on whom the future of model engineering must depend, should fully understand this.

While applauding the enterprise and ingenuity of those who design and construct tools and appliances, therefore, we should preserve a due sense of proportion in the matter and avoid the risk of model engineering developing into mere gadget worship.

Not so hopeless

I COULD not help being amused by W. H. Dobbs' letter [Postbag, August 29] and his statement that Stephenson's link motion " on paper, seems completely hopeless, the lifting link describes an arc, and the valve rod a straight line." He then asked why didn't something jam.

I wondered if Mr Dobbs had ever seen a connecting rod driving a piston. Here we have the big end of the connecting rod rotating in a *complete circle*, while the small end of the *same* rod reciprocates in a straight line. The principle of this is to be found in almost any working mechanism and is one of the simplest in mechanics.

The reason why something doesn't jam is that there is nothing to cause any jamming. In a Stephenson link motion, the lifting link certainly describes an arc which, however, is a comparatively small one, and this lifting link takes the expansion link with it as it swings backwards and forwards.

The valve-rod is attached at one end to the die which can slide up and down in the curved slot in the expansion link; or, to be strictly accurate, the link moves slightly, up and down, on the die. It is this ability to slide that prevents any tendency for the whole mechanism to jam.

In the case of the connecting rod, the jamming is prevented by the fact that each end of the rod is free to turn about a pin; the big-end on the crank-pin, the little-end on the gudgeon pin at the end of the piston rod.

To trained mechanics, all this is very simple, but I hope it will put Mr Dobbs out of his misery.

Cover picture

A three-quarter rear view of the Burrell Fearless. This picture, and also the others on page 514, *were taken by J. R. Green.*

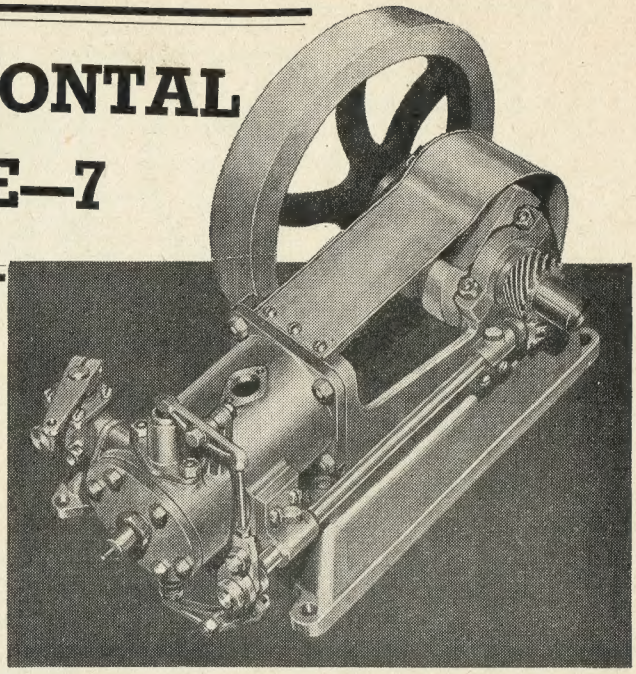
Giving lathe away

A NORTH OF ENGLAND reader has written to me making a very generous offer which I am pleased to pass on.

The owner of a 3⅝ in. Portass model S bench lathe, he finds his work keeps him so busy—seven days a week in fact—that he has no time to devote to model engineering. Rather than see the lathe stand idle he is prepared to give it to a promising youngster who cannot afford a lathe of his own.

Any lad wishing to avail himself of this very fine offer should write to me, giving brief details of his model engineer experience, commercial or professional background, and stating his age. Please mark the back of the envelope " Portass Lathe."

A 60 c.c. HORIZONTAL GAS ENGINE—7



By EDGAR T. WESTBURY

Continued from 26 September 1957, pages 455 to 457

Assembly and accessories

IN all open type engines, except those which run at very slow speeds, it is desirable to provide some means of preventing the broadcast spattering of excess oil from the crankhead bearing. The splash guard (part No 33) designed for this purpose is very simply made from sheet metal, suitably stiffened at the two edges by wiring or beading.

Readers who have had experience of coppersmithing will not need advice, but the novice may find it rather difficult to make a really neat job without the aid of special appliances. Further guidance on this and similar operations, including the tools employed, can be obtained from Herbert Dyer's book "How to work Sheet Metal." However, the desired result can be obtained by soldering a 16-gauge brass or copper wire along each side of the guard after it has been bent to the required shape.

The guard has a short apron strip attached to the lower end by three rivets, the object of this being to allow the bottom of the main strip to go inside the crankpit and thus prevent oil from creeping down the front edge of the casting. A gap in the centre of the apron gives clearance for fitting a drain tap or plug to the crankpit.

Two screws at this end and three at the other are used to secure the guard in position; the shape should be neatly arranged to produce a concentric arc around the shaft. As indicated on the drawing, the front of the guard may be utilised to carry a monogram or other insignia when finally completed.

MAIN ASSEMBLY

The essential parts of the engine now being complete, it may be assembled and set up for running in from a separate source of power while the auxiliary components are being made

The body is first secured to the baseplate by four studs or setscrews, care being taken to see that it beds down truly and naturally so that there is no tendency for it to be distorted when tightened down. Before assembling the crankshaft in the main bearings, a final check on their alignment should be made with a test bar; if this is found in order the shaft is then put in position and the caps fully tightened down, when it should be free to turn without either up-and-down play or excess friction. The flywheel and timing gear may be fitted to the respective ends of the shaft and keyed in position—either at this stage or later on.

It will be seen from the general arrangement drawing that the cylinder liner is located and secured by the rim end only, the skirt being free to take up its own position in case of differential expansion of the adjacent parts.

To prevent leakage of water at the front end of the jacket, a groove is provided for a rubber ring, which should be slightly compressed when the jacket is secured and thus act as a resilient gland. Rubber rings of all shapes and sizes are readily obtainable, but if any question of a substitute material should arise, ordinary water gland packing (plaited cotton impregnated with tallow) could be used.

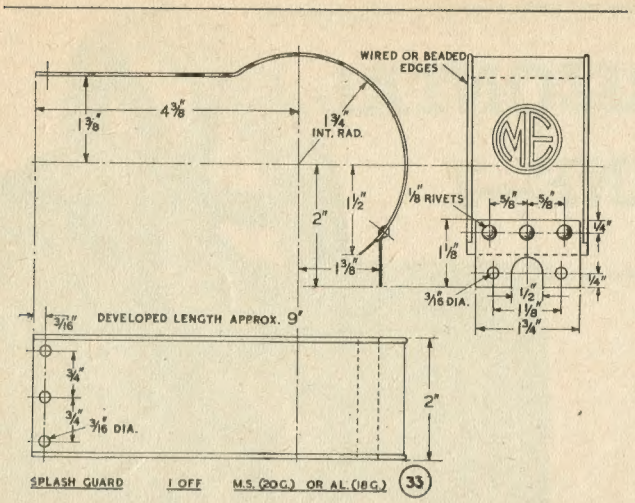
There is, however, a risk of trapping the material between the joint faces of the jacket and body casting, and this should be carefully guarded against, as it may throw the whole assembly out of truth. A precaution against this would be to fit a metal compression ring outside the packing and thus ensure that it is all positively pressed into the groove.

PISTON AND CONNECTING-ROD ASSEMBLY

Before fitting the piston in the cylinder, the piston ring gaps should be checked by inserting them separately, pushing them in with the end of the piston or a truly-faced plug so that they are square with the axis. The gap should not exceed 0.005 in. or be less than 0.002 in. for initial fitting in an engine of this size.

It is hardly necessary to warn constructors that piston rings should be handled with care, especially when springing them over the piston—experience will soon teach !

The piston, with its rings and gudgeon pin, is next assembled on the little end of the connecting-rod and inserted in the cylinder liner. This may be done from either end, but as the skirt of the liner is internally



chamfered this will help to guide the rings into position. If assembled from the other end, the rings will have to be carefully compressed to go into the cylinder, and the use of split band or hose clip will be found helpful. One of the features of most well-designed horizontal engines was that the piston could be inserted either from the cylinder head or skirt end, the latter being useful to enable the piston to be inspected or overhauled without breaking the breach end joint and, though of less importance in a small engine, the point has not been overlooked.

If the machining of the parts has been done correctly, there should be no doubt about the correct alignment of the connecting-rod, but if any question should arise it may be settled by assembling the rod and crankhead bearing *without* the piston, and checking its central position in the cylinder at all points of the stroke. Assuming, however, that all is in order the assembly may proceed as indicated, and the crankhead permanently bolted up.

CYLINDER HEAD ASSEMBLY

Directions have already been given for making the cylinder head joint both water-tight and gas-tight. Before fitting the head it is in order to assemble the exhaust and inlet valves, with their springs and collars.

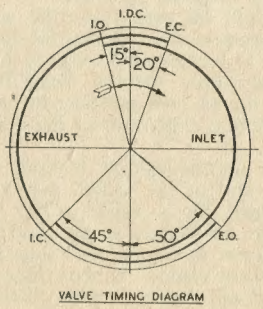
By the way, I have had one or two criticisms regarding the use of an aluminium cylinder head and, particularly, in respect of the exhaust-valve seating directly in this metal. On the strength of experience with previous engines, however, including the Apex Minor, which was capable of very high speed and power, I can assure readers that this is a perfectly sound feature—provided that sound castings of a good quality alloy are employed and that the machining and fitting are accurate.

One very important virtue of aluminium is its high heat conductivity, which helps to prevent overheating of both the valves and their seatings. There is certainly no objection to making the cylinder head of bronze or cast iron, or fitting inserted valve seatings of these materials, if it is considered desirable to do so.

CAMSHAFT ASSEMBLY

The camshaft bearings may now be attached to the side of the body and water jacket respectively, and their alignment checked with a test bar before fitting the shaft itself, with the timing gear either pinned or keyed to the end. After the meshing of the two gears has been re-checked, the two cams can be lightly pressed or tapped into their lateral positions on the shaft.

The inlet and exhaust rockers, with their rollers in position, are then fitted and clearances roughly adjusted so that both valves are just closed when the rollers are resting on the base circles of the cams.



VALVE TIMING DIAGRAM

If the fit of the cams on the shaft is as recommended—just sufficiently tight to enable them to be moved stiffly with a pair of gas pliers, not forgetting a strip of leather or soft fibre between the jaws—they may be timed in position. Alternatively, a grubscrew may be temporarily fitted to the boss of each cam to hold it in its correct place until it can be pinned permanently to the shaft.

The timing diagram should be marked out and attached in any convenient way to the shaft. Many constructors may prefer to mark it out on the rim of the flywheel, where it may remain as a permanent check but, if so, remember that the diagram is set out for clockwise rotation and should, therefore, be marked on the *inner* side of the flywheel or else reversed if marked on the outer side.

A fixed index pointer should be temporarily attached to any convenient point on the body or base, and set first of all to check up on the *TDC* and *BDC* positions.

The crank is now rotated to the opening and closing points of each cam in turn, and the cams set to correspond. It will be found that there is a small amount of lost motion in the operating gear owing to necessary working clearances, and the opening periods will thus be slightly shorter than as specified.

If the opening points are set exactly to the diagram the valves will close a little early; it is thus necessary to "split the difference" or, alternatively, to reduce the base circles of the cams to allow for tappet clearance.

As I have explained this complicates cam design, and as timing is not critical I have not worried about it unduly. It is only at really high speed that these matters become of vital importance. The cams are finally fixed by well-fitted taper or parallel pins.

One minor error, or rather omission, will be found in the camshaft design—namely, the lack of any positive means of eliminating end play, but this is easily remedied by fitting a distance collar or lengthening the boss of the inner cam. The thrust of the timing gears tends to keep the shaft in place, but positive location is much to be preferred, especially as endwise movement will alter the timing of spiral gears.

Incidentally, these gears cannot be marked for subsequent assembly in quite the same way as spur gears, but as the teeth are few in number no great difficulty will arise in re-timing.

CONTACT BREAKER

If coil ignition is to be employed, a substantial and reliable form of breaker mechanism is necessary. The old type of coil, with its vibrating breaker, will work in conjunction with a very simple " wipe " contact. Some of the devices employed were extremely crude, both in design and construction; they all worked after a fashion, but inevitably gave trouble sooner or later. At the present day trembler coils are unobtainable, unless one is lucky enough to pick them up on the junk market. The old Model T Ford used four of these coils, and some of them may still be in existence.

However, the only real merit of the trembler coil is that one can check whether the circuit is working by the buzz when it makes contact—though that does not prove whether it is producing an effective ignition spark ! The modern motor-car coil, with its separate condenser and mechanical breaker is, generally speaking, more reliable and efficient provided that the required battery power is available.

The contact breaker shown here is designed to clamp on the extension of the rear camshaft bush, and employs a standard form of motor-car breaker arm which can be obtained from most dealers in car spares.

I have found that many garages have dozens of discarded ignition parts on the scrap heap which, if one takes the trouble to dress the contact tips, are quite serviceable. But if the latter are almost burnt away then they are, of course, useless.

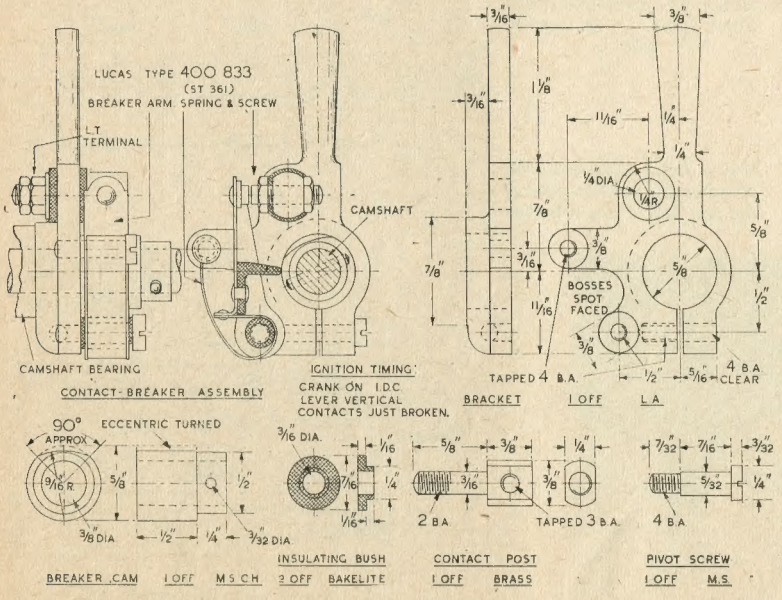
Should the exact type shown here not be readily available there are others similar—except for details and dimensions—which will serve equally well if the necessary modifications are made to other components.

The stationary contact in most modern car ignition equipment is attached to an adjustable plate, but for present purposes a screw is more convenient, and standard tungsten-tipped screws are available.

If one is fortunate enough to possess an ancient magneto with platinum contacts, this will be better still in all respects apart from durability. Incidentally, it is also possible to use the armature as an ignition coil so long as it is electrically sound.

The parts of the contact breaker are relatively simple, and machining is quite straightforward. A casting is recommended for the bracket, though it can easily be made from solid. It is bored to a close fit on the bush extension and split to take a clamp screw so that it can be frictionally adjusted to advance or retard the spark. The holes in the face of the bracket are all spot faced to provide true seatings, square with the central axis.

The contact screw is fitted to a brass terminal post, which may either be made from round bar, flattened on each side as shown, or from square material if available. It is cross drilled and tapped squarely for the contact screw, and the shank is made long enough to project through the bracket and serve as a terminal stud, being insulated by two spigoted washers of bakelite, ebonite or other hard plastic material.



Care must be taken to locate the respective parts so that the contact faces line up truly when assembled. If necessary, the pivot screw may be made in the form of an eccentric bolt, like the valve rocker pivots, and secured by a nut at the back of the bracket.

A very simple form of cam is used to operate the breaker; it may be made in a similar way to the valve cams, but the simplest method for forming the contour is to set the blank over about $\frac{5}{16}$ in. eccentric to the axis and turn away about 90 deg. of the surface as shown.

Its position is not critical, as ignition timing can be adjusted over a wide range by shifting the lever, but it will be convenient to arrange matters so that the lever is near the vertical position for normal running.

Alternative methods of ignition include the use of a magneto, a low-tension or " glow " plug, and tube ignition. The former can be recommended for reliability, but a standard type of magneto is somewhat out of proportion to the size of the engine. Small flywheel magnetos, as employed on cycle motors, are quite satisfactory but they call for a rather high starting speed to produce an efficient spark.

The type of glow plug as employed on miniature racing engines is not satisfactory for use with gas or petrol unless it is kept permanently connected to the electric supply, and, as the current consumption is relatively heavy, it would not be so efficient in this respect as a high tension coil.

I am, however, of the opinion that it would be possible to produce a heater element, which would keep hot enough for ignition after the engine has been started, with any kind of fuel —though this would call for some experimental work.

Tube ignition was the most popular method on stationary engines for many years, and various materials were employed for the tubes, including iron, porcelain and platinum, all of which were reasonably successful in practice. The principal disadvantage of this method on small engines is that it may take more fuel to heat the tube than to run the engine !

However, the use of a very small capillary tube of heat-resisting alloy reduces the heating problem besides increasing efficiency, and Mr D. H. Chaddock has made some interesting experiments in this method, the results of which he has promised to put on record.

I would choose high tension ignition, either by battery and coil or magneto, on the strength of general experience with all methods of ignition over a period of many years.

To be continued

A leadscrew clutch for the EW lathe

In this article MARTIN CLEEVE details the fitting of a dog clutch

SOME readers may have wondered why I did not run a descriptive series in step with the various alterations and additions to this lathe, but if I explain that such a course did not appeal to my sense of the dramatic and that I took the liberty of juggling with time in order to begin the series from the end result with a reasonable splash I feel that I shall be forgiven.

On the question of the clutch itself, I have been asked why I did not fit the more orthodox split, or half-nuts. Such a course did occur to me. In fact, I was on the point of designing a saddle apron when I realised that to complete the job a rack and pinion traverse would also have to be added otherwise with the half-nuts open the saddle would be without control !

Moreover, the fitting of a rack and pinion would have necessitated the re-siting of the leadscrew to make room for it—an undesirable complication.

GENERAL FEATURES

This clutch unit (Fig. 1) was designed to avoid the necessity for splined shafts. Briefly, the leadscrew was shortened and provided with a new bearing behind the driven dog member. The driving dog is mounted on a new sliding spindle made to replace the piece cut from the leadscrew.

This spindle (Fig. 2*A*) is supported at the left by the original bearing lug, and at the right by a $\frac{5}{16}$ in. dia. step which pistons in a hole of that size, drilled and bored in the cut end of the leadscrew to a depth of $1\frac{5}{8}$ in.

When the driving dog (Fig. 3*A*) is moved to the left by the control lever (Fig. 2*B*) and clutch rod (Fig. 3*B*), the spindle and leadscrew gear move with it. The 1 in. dia. collar on the sliding spindle prevents the gear from disengaging with its driving collar and pin.

Fig. 4 shows both clutch positions, below, the engaged and, above, the disengaged. It will be noticed that (above) the leadscrew gear is not fully in mesh: it is, in fact, taking the place of a splined shaft.

Of course, the partial meshing of these gears when the clutch is open does not matter as, in this condition, there is no load upon them. Gear synchronism is, however, held.

The component parts of the unit are laid out in Fig. 5. In the back row, the first three pieces at the left are for the driving clutch, the centre of the three being the loose ring for shifting it, and the left the threaded collar for retaining the ring in position. The fourth is the driven dog and the fifth right, the new leadscrew bearing piece. Middle row, extreme right, is the clutch rod support plate.

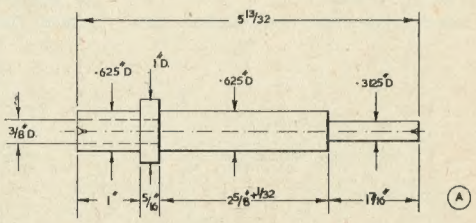
SHAPING THE ADDITIONAL BEARING

The shaping of the additional leadscrew bearing (Fig. 6*A*) was facilitated by my friend's idea of taking a Plasticine impression of the bed casting at that point. The bearing block must be shaped and fixed in position before boring so that *1* it is vertical and *2* it stands out at right angles.

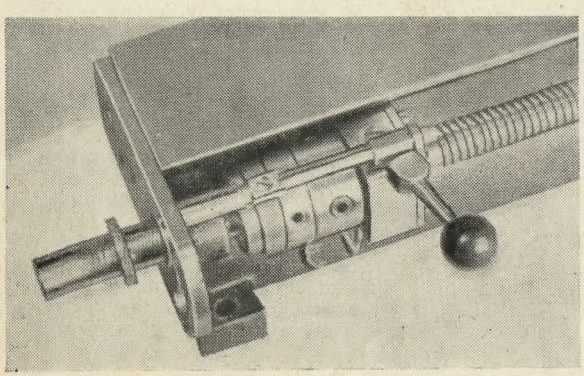
The distance between the inner face of the new bearing and the inner face of the existing cast lug is 2 in.; therefore, the hole in the lathe bed for the fixing screw is $2\frac{3}{8}$ in. along from the inner face of the lug. This hole is drilled approximately halfway up the flat portion of the casting beneath the lathe bed.

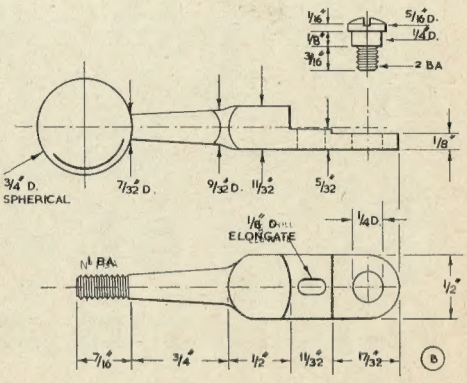
It is important that the Plasticine impression be taken at this point as

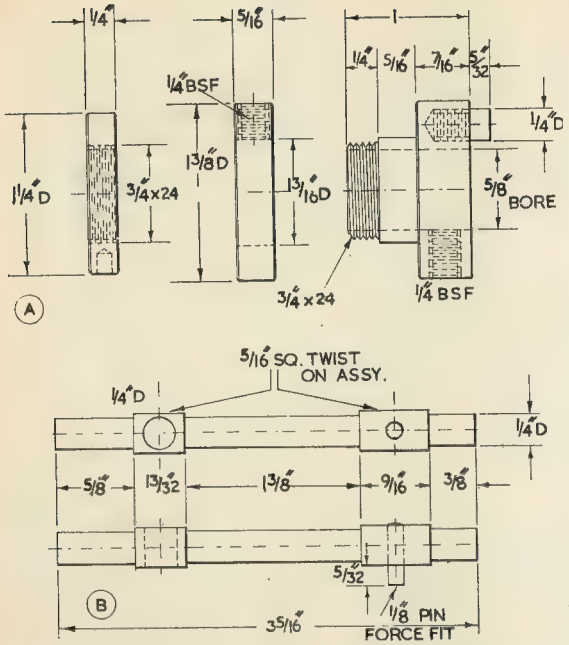
Right, Fig. 2: A *Sliding extension spindle for leadscrew*; B *Leadscrew clutch lever (from* $\frac{1}{2}$ *in. square stock)*

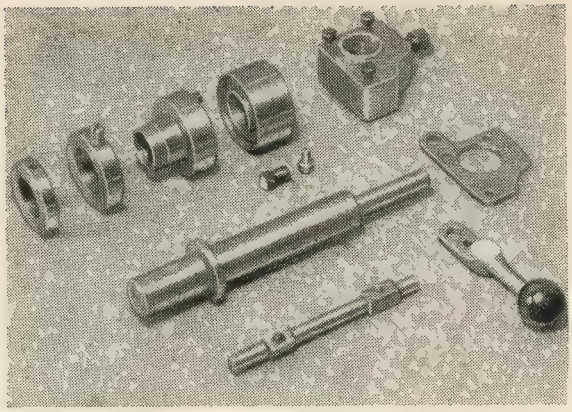


Below, Fig. 1: *The complete clutch unit. For this picture the headstock was removed*









Above, Fig. 5: The chief clutch components

Left, Fig. 3: A Driving clutch member components; B Clutch rod

the casting is rather uneven and cannot be reached easily for facing by hand tools.

The arrangement in Fig. 7 shows the preliminaries adopted to mark the centre hole in the additional bearing before boring. Having adjusted the temporary bushing, fixed to the saddle in the manner shown so that the uncut leadscrew is free to revolve, the leadscrew may be removed, the additional bearing piece (Fig. 6*A*) re-fixed and the exact centre marked by passing a short length of accurately pointed $\frac{5}{8}$ in. stock through the original and temporary bearing on the saddle. Actually, I lightly force-fitted a centre drill into a piece of $\frac{5}{8}$ in. stock, and made the centre mark by hand-twiddling it.

Having found the centre in this manner the piece may be held in a four-jaw chuck for boring in the normal way. But even though great care was taken to fulfil the required conditions, the bearing alignment on final assembly had to be adjusted with the help of a small piece of shim stock before the (uncut) leadscrew would revolve freely in all three bearings.

Although this new bearing is held by only one $\frac{1}{4}$ in. BSF screw, this is quite satisfactory as the heaviest loading on the leadscrew is not of a nature likely to try to move it: the purpose of the bearing is more to maintain easy alignment between the screw and sliding shaft and to prevent a bending and locking action which would certainly take place without it.

The 2 BA hole at the top is for the hand lever pivot screw (Fig. 2*B*), and the clutch rod support plate (Fig. 6*B*) has a shape similar to the bearing block. This seemed the most expeditious.

THE SLIDING SPINDLE

As the $\frac{5}{16}$ in. dia. step at the right had to slide and sometimes revolve in the leadscrew, the new spindle was made of silver steel. To economise in material, the main spindle was machined from $\frac{3}{4}$ in. dia. stock, and the 1 in. collar and sleeve were force-fitted on to a $\frac{3}{8}$ in. dia. as shown by the broken lines at the left (Fig. 2*A*).

The collar, grubscrew and pin method of obtaining a drive from the change gears was retained, a flat being formed on the $\frac{5}{8}$ in. $\times$ 1 in. step to receive the grubscrew.

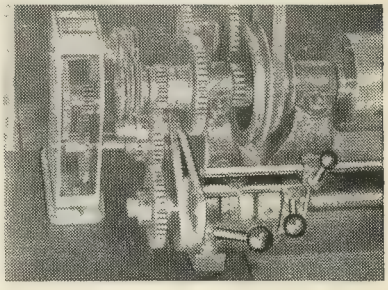
Both dog members are made from mild steel. The centre component of the driving dog (Fig. 3*A*) is the cast-iron ring which, on assembly, is loosely mounted and retained by the threaded m.s. ring at the left. It will be found preferable to machine the cast iron after the threading operations, then when the retaining ring has been screwed home, the exact width necessary for a free fit of the cast ring can be found easily.

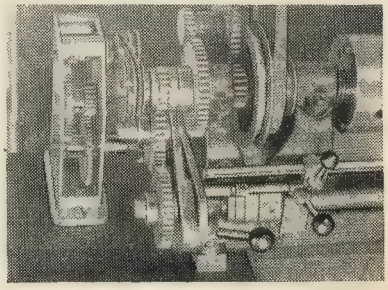
Care should be taken not to make this much thinner than $\frac{5}{16}$ in. as it has to be tapped $\frac{1}{4}$ in. BSF for the pin which enters the clutch rod.

The clutch rod (Fig. 3*B*) is made easily from a length of $\frac{5}{16}$ in. square m.s. The hole at the left should offer a snug fit for the pin just mentioned. The rod is coupled to the hand lever by the $\frac{1}{8}$ in. pin at the right. Support is given to the clutch rod at the left by means of a small sleeve made from $\frac{3}{8}$ in. dia. m.s., drilled one end for the rod and threaded at the other for screwing into the change-gear quadrant fixing plate.

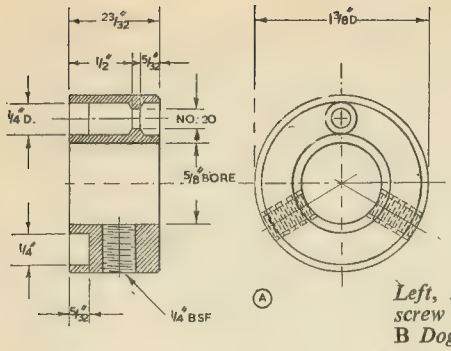
Deciding upon a reasonable design for a small lever is not always easy. Each new case seems to present fresh difficulties. This particular lever (Fig. 2*B*) was " designed " by hacking at a piece of $\frac{1}{2}$ in. square m.s. until it looked right and did its job.

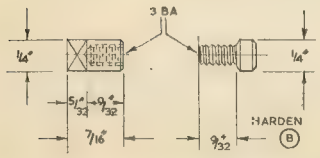
The driven dog " tooth " is accommodated in an annular recess machined in the body. This gives a tidy appear-





Above and below, Fig. 4: The clutch in both positions; disengaged above

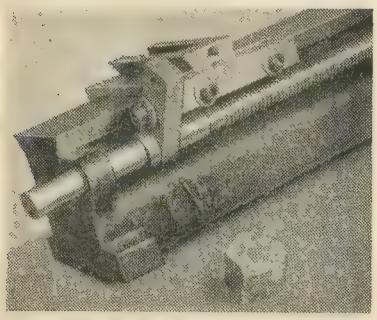


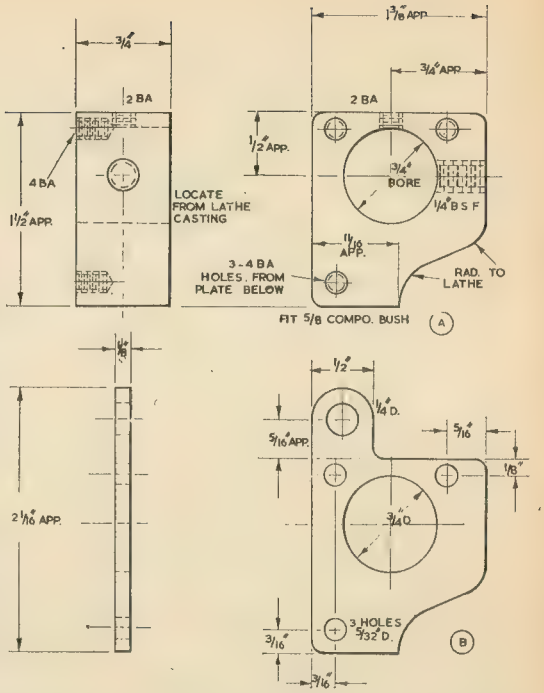


Left, Fig. 8: A *Leadscrew clutch member*; B *Dog tooth and screw*

Right, Fig. 6: A *Additional leadscrew bearing*; B *Clutch-rod support plate*

Left, Fig. 7: *The temporary saddle rig for finding the centre of the extra leadscrew bearing. The foreground includes the piece of Plasticine used to take an impression of the bed contour*





ance to the fitting, though it may be a little too troublesome for some. The dog tooth and screw (Fig. 8*B*) were certainly a bit of a nuisance to make and fit.

HOW TO BORE THE LEADSCREW

Naturally, for those without access to another lathe, cutting and boring the leadscrew must be the very last job.

I think this could be done on the EW lathe by making the leadscrew itself take the place of the lathe spindle. To do this it would be necessary to make two bushes (brass or cast iron would serve) for the headstock bearings, $\frac{3}{4}$ in. o.d. and $\frac{5}{8}$ in. bore to suit the leadscrew, and a third bush of m.s. for the lathe pulley.

The lathe pulley bush should be slit along one side so that tightening the grubscrew would close the bush on to the leadscrew and grip without marking. As it would be probably very difficult to adjust the EW top slide to bore a parallel hole, the saddle could be driven, or traversed, in the normal way by providing it with another temporary nut—$\frac{1}{4}$ in. BSF if more convenient—and a length of screwed rod fitted with a handle at the tail-stock end.

My notes on this job show that: "a piece $3\frac{1}{2}$ in. in length was parted from the leadscrew with a tool about 3/64 in. wide," but as all EW screws may not be of the same length, perhaps my second note would be preferable—"cut LS to leave a $1\frac{3}{16}$ in. gap between the cut and faced end and the inner face of the cast bearing lug at the quadrant end."

The $\frac{5}{16}$ in. end of the sliding spindle should fit into the leadscrew without bind or shake. When the leadscrew bore is completed a very small hole should be drilled radially at the blind end to connect the bore with atmosphere.

THE CLUTCH IN USE

The value of the clutch for instantly disengaging at the end of a self-acting or screw-cutting pass need not be emphasised. But it is worth noting that threads which are the same as, or exact multiples of, the number of threads per in. on the leadscrew, may be screwcut without bother.

In the case of the EW, which has a leadscrew with eight threads per in., 8, 16, 24, 32, 40, etc., t.p.i. may be cut by engaging the clutch at any moment for each fresh pass of the threading tool; the original (first cut) thread groove will always be followed.

For a thread such as 26 t.p.i., which is not an exact multiple of the eight on the leadscrew, synchronism can only be assured by: *1* reversing the whole without disengaging the clutch; *2* chalk marking the change gears and making sure that they are always in the same relative positions before beginning each fresh pass of the threading tool by the re-engagement of the clutch.

Beginners would find it instructive and worth while to try this before an actual thread is needed for a particular job. It would not be necessary to cut more than one light spiral; this would serve quite well to show whether or not the tool point was following it on subsequent passes.

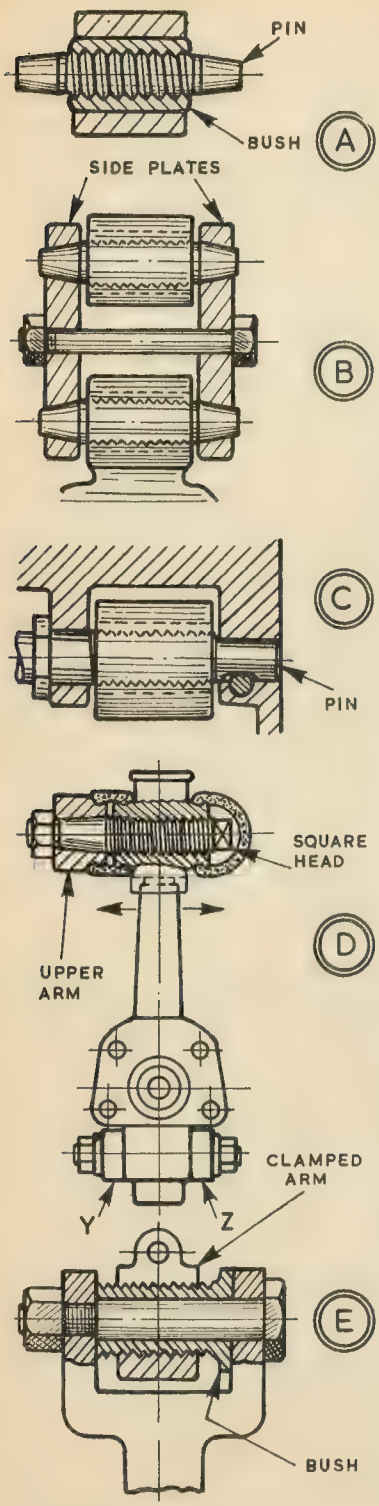
It is also worth remembering that it is better to spoil a component than to allow the saddle to run into the headstock or stop rod when geared for screwcutting.

It should be remarked that none of these notes on synchronism or "picking up," as it is sometimes referred to, hold good for dog clutches having more than one tooth.

Finally, it is interesting to reflect on the fact that a screw-cutting indicator, such as is sometimes fitted to the saddles of larger lathes, would be quite useless to the EW, for, as the saddle always moves with the leadscrew, the indicator dial would remain stationary under all conditions ! ▣

Screwed pins and bushes

By Geometer



ALTHOUGH it is bad practice to employ screwed or threaded pins in plain holes where movement is to occur, yet properly designed assemblies of screwed pins and bushes can, where applicable, provide certain advantages by simplifying construction and furnishing means of particular types of adjustment.

Screwed pins in plain holes are bad practice, of course, for the reason that bearing surfaces are considerably reduced, only the crests of the threads touching in the bores to carry the bearing loads. Wear and play speedily occur as the bores become grooved and the tops of the threads flattened; and this applies to some extent even where there is no intended relative movement between pins and bores. For best results, therefore, screwed pins (or screws and bolts) should always have a plain part to fit in bores—unless the assemblies are otherwise designed.

To permit the use of screwed pins and bushes, assemblies must work with a limited oscillating or to-and-fro movement, and be able to accept a small amount of side movement. Movement through any more than a reasonable arc would result in too great displacement sideways—of pins or bushes. Some side movement is inevitable, of course, and assemblies must be able to accept it.

Given this, however, screwed pins and bushes automatically provide side location on the threads, and can carry thrust loads which would otherwise demand fairly substantial shoulders or thrust surfaces. Depending, also, on how pins and bushes are screwed together, some initial or subsequent adjustment is possible.

Assemblies most commonly employing screwed pins and bushes are the road springs, suspension and steering systems of cars; but such pins and bushes need not be exclusively confined to these applications; and as they are obviously capable of withstanding fairly severe duty, there are probably many other assemblies where it would be unusual but not necessarily incorrect practice to employ them.

A screwed pin and bush for a leaf spring is as at *A*. Both pin and bush are of hardened steel, the pin having taper ends to fit in the shackle side plates, while the bush is pressed into the eye of the spring. A similar pin and bush assembly is fitted to the axle or chassis, and the whole then appears as at *B*.

Side plates fitting on the taper ends of the pins are held together by a central bolt. Generally such assemblies may be dismantled with ease, the centre bolt merely being removed and the side plates prised or tapped off—with the weight of the vehicle taken on jacks. Each pin has a greaser at the end, not shown.

Where there is no shackle incorporated, but the spring eye is mounted direct on a pin on the axle (quarter elliptic spring), the fitting may be as at *C*. The pin is then screwed into the bush in the spring, and has plain diameters fitting in bores in the axle bosses, with a cotter for security. Flats on the flange on the pin, or a hexagon flange, enable a spanner to be used for removal, for the pin cannot be driven out.

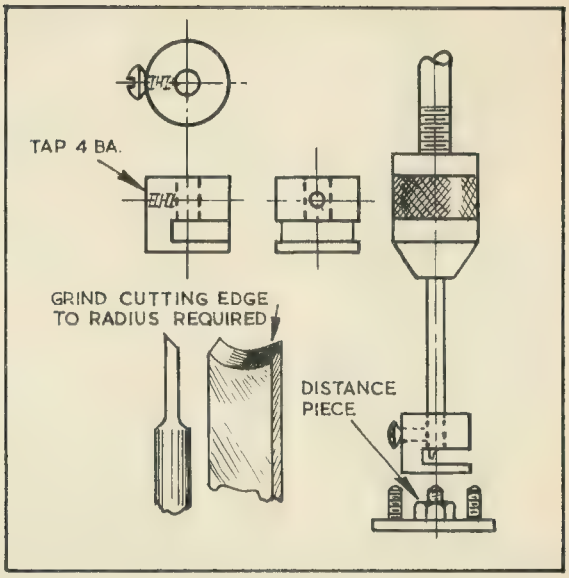
Care is required in fitting the bush to the spring, to maintain the eye approximately central, with the pin in the attitude for fitting the cotter —as the pin can only be rotated whole turns of threads, which may displace the eye too far one way or the other.

At *D* is a screwed pin assembly for the upper swinging arm of an independent front suspension (Morris). The lower arm is forked with bosses *Y*, *Z*. A taper and nut secure the pin to the upper arm; and a square head at the opposite end—with rubber cover—enables setting before fitting to obtain correct castor angle.

At *E* is a screwed bush fitting for a similar purpose. The bore is plain and the outside threaded, so the setting can be varied in the end of the clamped swinging arm. Eccentricity between outside and bore of the bush also permits varying camber angle. ▣

Readers' hints

This is the feature where readers exchange workshop tit-bits gleaned from personal experience. Each idea published receives a Percival Marshall book voucher for 10s. 6d.



Stud trimming tool devised by Mr C. Maude

TRIMMING STUDS AND BOLTS

HERE is an idea for a small inexpensive gadget for trimming studs and bolts down to size and leaving a nice radius on the end.

Old drills that have broken off very low down or bits of silver steel are used, the size of drill being a little larger than the studs to be finished. Grind each side flat, like a screwdriver, then on the corner of a grinding wheel put on the required radius. Fit into a metal boss and insert a small distance piece over the stud or bolt to the required height, and then fit the gadget into a small hand drill and proceed to turn with just enough pressure on to make the cutter cut satisfactorily.

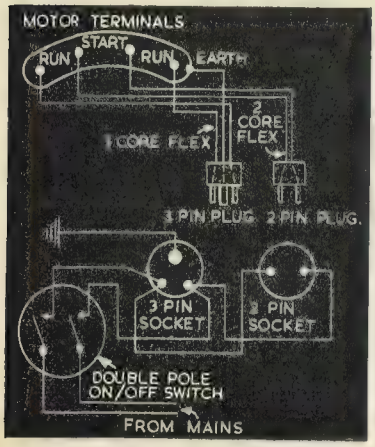
Repeat on any other studs that require trimming to size.

Below, right, is a method of sharpening twist drills so that they cut discs out of sheet metal leaving a nice clean hole; do not run fast and feed evenly.

The centre prong should be a little longer than the two outer ones in that it holds the drill steady and central during the drilling, the centre point being ground to a sharp point and left with square sides, as in the square lathe centre.

This drill is very useful for driving long holes with the grain in wood as it has a lesser tendency to follow the grain and run out. Sharpen like a joiner's twist bit.—C. MAUDE.

Wiring diagram for Mr Ford's method of reversing a Super 7



REVERSING A MYFORD SUPER SEVEN

RECENTLY I invested in a Myford Super Seven lathe, together with a number of accessories, but I was not able to obtain a reversing switch.

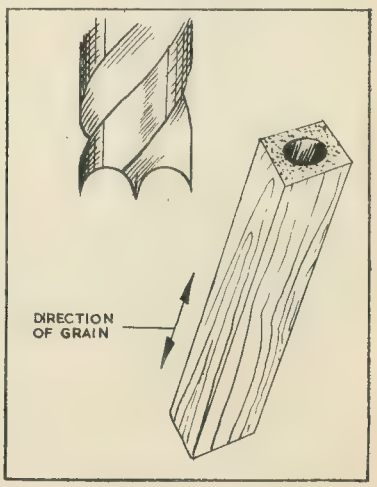
As I am liable to be transferred to any of the three territories in East Africa I wanted to make the lathe and bench set-up easy to dismantle, and with this in view I fixed a normal three-pin socket on to the bench with a lead to the nearest power point. In parallel with this I wired a two-pin socket.

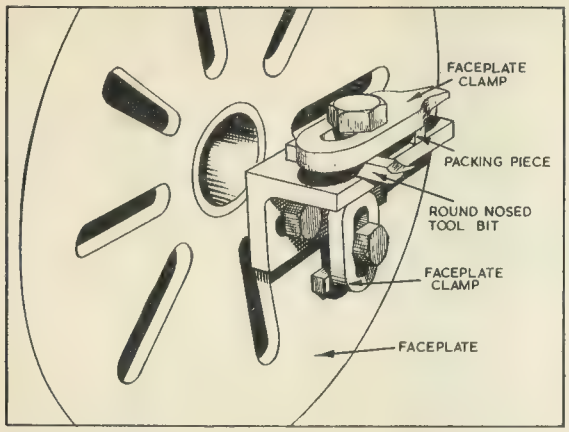
The two running terminals on the motor I connected to the line and neutral pins on a three-pin plug which fits into the socket on the bench. The motor is earthed through the third pin.

The two start terminals on the motor I connected to a two-pin plug for the other socket on the bench. This gave an easy method of disconnecting the wiring when the motor was taken off the lathe for packing purposes, and also a cheap method of reversing the direction of rotation of the motor.

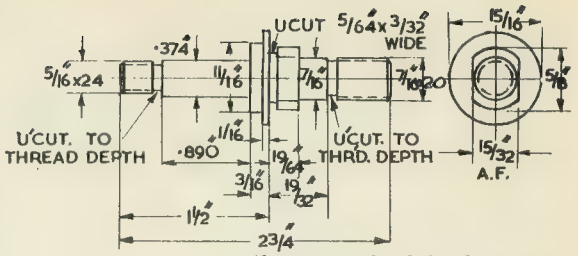
To reverse the motor all I need do is to switch off (at a separate switch at the front of the bench), remove the two-pin plug, replace it in the socket the other way round, and switch on again.—L. S. FORD.

Drill for cutting sheet metal and drilling straight holes with the grain of long pieces of timber



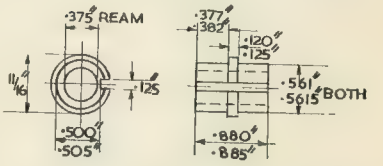


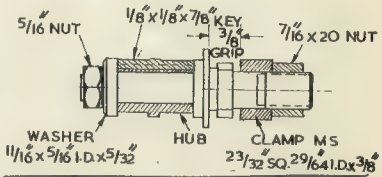
Left: Details of Mr Message's device for emergency flycutting



Above: Details of the change gear and intermediate stud described by Mr Hutchinson

Below: Further details of Mr Hutchinson's device showing the intermediate hub and the general assembly





FLY-CUTTING IN AN EMERGENCY

HERE is an idea that will overcome the difficulty when suddenly confronted with a fly-cutting operation for which no ready-made fly-cutter is available.

The drawing shows the set-up, consisting of a tool bit clamped to a small angle plate which in turn is clamped in a radial position on the faceplate, with the tool presented in correct relationship to the work.

A similar section of tool bit is used for the clamp packing. The small angle plate will usually allow only a single hole fixing to the faceplate, so a clamp is added to improve rigidity.

The arrangement works well, tool pressure being taken by the angle plate which is also capable of a wide range of adjustment. A small balance weight may be required to counter the offset weight, and the cutter should be run at bottom direct speed.—J. W. E. MESSAGE.

CUTTING METRIC AND OTHER THREADS

OWNERS of South Bend 4½ in. centre simple screwcutting lathes, and of others of similar type, may be pleasantly surprised to find many metric pitch threads may be cut, with good accuracy, using the standard change gears ordinarily furnished.

Extra gears, often specified to cover the range from 0.5 to 4.0 mm. pitches of the International Metric regular and fine thread screw systems, have 20, 24, 28, 36 and 127 teeth. The latter is a fairly costly "translating" gear, and its number of teeth is prime, i.e., the factors of this number are itself and one. Its use may be avoided, if desired, by using regular gears properly arranged—however, for pitch range coverage, the four smaller gears mentioned are necessary.

The arithmetical lead error introduced by the slight error in gear ratio is less than 0.0007 deg. (seven ten-thou) per inch of screw length, or about one quarter of the lead error in commercial cut-thread (*not* ground thread) taps. This is usually negligible.

The lathe mentioned is not always made with intermediate change-gear-studs suitable for compounding the gearing. It is suggested two such studs and hubs be made as per sketch.

Also, extension of the slot in the change gear swing arm about 5/32 in. toward its hub will enable proper gear mesh.

The gears are 18 d.p., 14½ deg. pressure angle, ⅜ in. ± 0.005 in. face, 0.562 in. bore, and key-seated ⅛ in. wide × 1/16 in. Those furnished with the lathe have teeth as follow: 16, 32, 32, 40, 44, 46, 48, 52, 54, 56, 60, 72, 80 and 116.

There is also a permanently assembled six to one compounding gear with 18 and 108 teeth respectively, and the 108 side is ordinarily used in screwcutting as an idler. The requisite new gears have 20, 24, 28 and 36 teeth.

Gear ratios suggested are tabulated alongside. In some cases a make-up idler, to fill out the space, is required. This usually happens when the sum of the numbers of teeth in all four or six compounded change gears is, for the lathe in question, less than 196.

The leadscrew has eight threads per inch.

CHANGE GEARS FOR METRIC THREADS

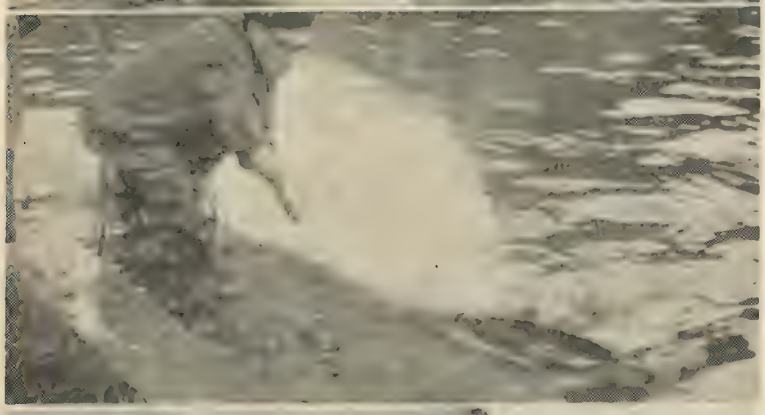
The same gears are usable for cutting worms with axial pitches corresponding to diametral pitches in which case, to cut 7 d.p. lead, *two* 28 tooth gears are needed. These gear sets are next tabulated.

Pitch in mm.	Drivers/Followers	Idler required ?
4.0	52/44 x 64/60	No
3.5	52/44 x 56/60	No
3.0	52/44 x 48/60	No
2.5	52/44 x 40/60	No
2.0	52/44 x 32/60	Yes
1.75	52/44 x 28/60	Yes
1.50	52/44 x 24/60	Yes
1.25	52/44 x 20/60	Yes
1.00	52/44 x 16/60	Yes
0.9	52/40 x 36/44 x 16/60	No
0.8	52/40 x 32/44 x 16/60	No
0.75	52/32 x 24/44 x 16/60	No
0.7	52/40 x 28/44 x 16/60	No
0.6	52/40 x 24/44 x 16/60	No
0.5	52/48 x 24/44 x 16/60	No

CHANGE GEARS FOR DIAMETRAL PITCH SCREWS

The arithmetical lead error due to approximation of TC by the fraction 22/7 is about 0.0004 (four ten-thou) per inch of thread length.—R. V. HUTCHINSON, Birmingham, P.O., Mich.

D.P.	Axial Pitch as fraction of an inch	Drivers/ Followers	Idler ?
6	22/42	64/24 x 44/28	Yes
7	22/49	64/28 x 44/28	Yes
8	22/56	64/32 x 44/28	Yes
9	22/63	64/36 x 44/28	Yes
10	22/70	64/40 x 44/28	Yes
12	22/84	64/48 x 44/28	Yes
14	22/98	64/56 x 44/28	Yes
16	22/112	44/28	108T
18	22/126	64/36 x 44/56	No
20	22/140	64/40 x 44/56	No
24	22/168	64/48 x 44/56	No
32	22/224	44/56	108T
36	22/252	64/56 x 44/72	No
48	22/336	32/48 x 44/56	Yes



Huddersfield

Reported by

THE Huddersfield SME have a clubhouse and grounds at Highfields, only a few minutes' run from the centre of the town, and are fortunate in having a pond as well as a track. Since a good number of the members are powerboat men, this is doubly fortunate !—or is it a case of cause and effect ?

On a recent club day, at one end of the rectangular pool stood wader-clad Les Oldfield and Jack Tetley starting up the former's new hydroplane *Mimi*. A buzz, a crackle of the exhaust and away she went round the pole—to do a spectacular nose-dive after about half a lap! The ever-cheerful Les fished her up, emptied her out, and put her to dry on the bank while the pair started up one of Jack's boats.

Another hydroplane enthusiast was J. M. Jones, of Maghull, who is well-known at regattas with his boat *Mambo*. In the last year or two he has achieved several successes with the boat—well-deserved ones, for he has been persevering, experimenting, and improving since 1936. Jim had brought his smaller boat *Goed* to Huddersfield, and we were treated to several sparkling runs from her, as well as from the boats of Les and Jack.

Prototype boats

A much-admired prototype vessel is the 4 ft 3 in. freelance tug *Alpha* built by Vic Briggs, of Huddersfield. The boat is steam-driven and radio-controlled, and looks extremely well in the water. At the transmitter was Vic's son John, who had managed a day's pass from the RAF.

Another father-and-son team were the Calverleys—father built the cabin cruiser, and schoolboy son works the radio. A fascinating feature here was the bikini-clad lady who daringly water-skied behind this boat. She was carved from balsa and suitably painted, while her skis had added planes of thin Perspex to give more buoyancy.

Reading from top to bottom. First picture: Charles Robinson, Huddersfield secretary, taking on passengers for his SARASTRO. *Second: J. M. Jones, of Maghull, launches his hydroplane* GOED. *Third: Peter Sykes, builder-driver of the 3½ in. gauge* BANTAM COCK, *also has an excellent* ROYAL SCOT. *Bottom: Leonard Foote with his fully-detailed channel packet* ST GEORGE

Club Day

Northerner

Roger Jennings was yet another youngster enjoying himself with his father's boat, a 3 ft 9 in. cabin cruiser with planked hull. Mr Jennings has also made the steam plant himself—a small oscillating-engine steamed by a boiler with two Smithies' tubes, fired by blowlamp. A simple layout which gave good results and a very satisfactory performance.

At last autumn's Huddersfield Exhibition I described the dry dock built by Leonard Foote and C. F. Woollard, with the former's freelance cross-channel vessel *St George*. This boat looks very well indeed in her proper element, with her wealth of deck fittings, ventilators, and lifeboats, and she goes at a nice scale speed. She is steam-driven.

Mr Woollard is a former Cunard engineer-officer who did well over a hundred trips on the old *Caronia*, and it was after her that he named his freelance liner, now ten years old. She too is steam-driven, with a Stuart BB engine steamed by a Yarrow type boiler. Incidentally, how pleasing it was to note the silent operation of the several steam-driven boats at Huddersfield, in contrast to the rather rackety progress of the diesel driven ones !

Locomotives at work

On the track, Eric Preston was driving a 3½ in. gauge LMS 4-6-0 (LBSC's *Doris*), owned by Ron Birkbeck. Ron is away for the summer, but rather than have his engine lying idle has asked Eric to give it an outing on club days. The latter, meantime, is looking forward to running his own ¾ in. scale Schools class, which is very nearly finished, and has done well under steam test.

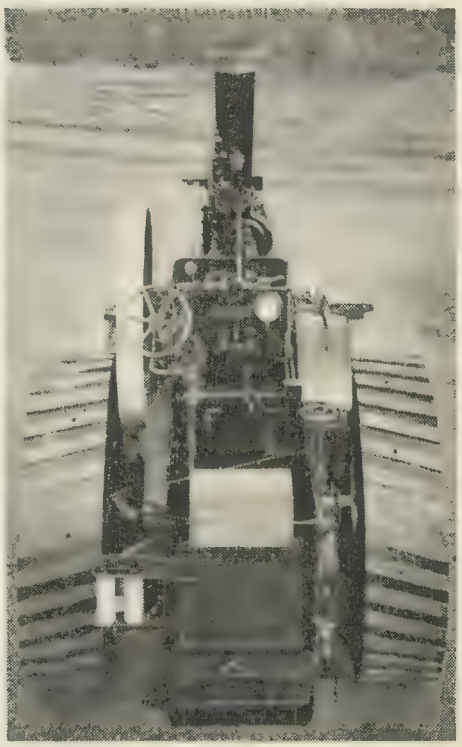
Sheffield clubman Colin Tissiman had brought along his 2½ in. gauge *Galatea*, built to LBSC's 4-6-0 *Olympiade* design, but without the inside third cylinder. She steamed well, and was quite at home on the straights, but the rather close radius of the curves bound her flanges badly and her performance suffered accordingly.

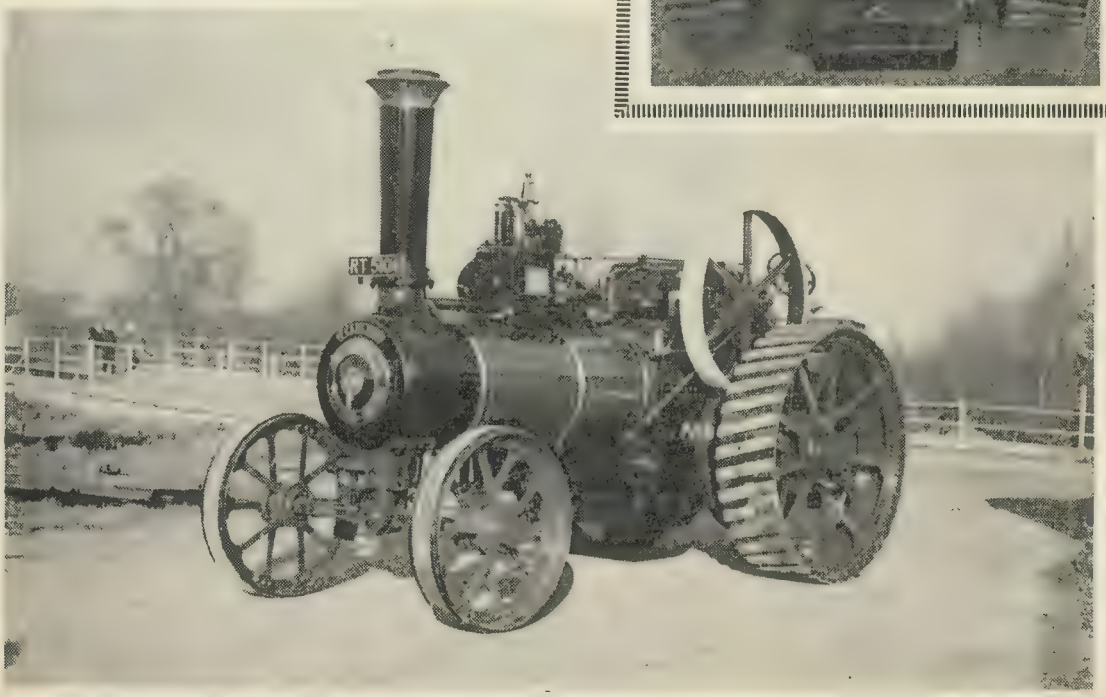
Rather than hold up traffic Colin soon took her off, but it was not long before he was piloting *Sarastro*, a 3½ in. gauge 2-6-2, built six years ago to *Bantam Cock* design by Charles Robinson, who is now the Huddersfield secretary. Another *Bantam Cock* which has had six years' running was that of Peter Sykes, who also was helping to keep happy the queue of youngsters waiting at the "station." ▣

Reading from top to bottom. First: Built to LBSC's OLYMPIADE *design, Colin Tissiman's* GALATEA *is a handsome engine. Second: C. F. Woollard, former Cunard engineer-officer, with his freelance liner* CARONIA. *Third: Sheffield member, Colin Tissiman, driving* SARASTRO *with builder Charles Robinson as a passenger. Bottom: Roger Jennings thoroughly enjoyed himself looking after Dad's cabin cruiser*

FEARLESS . . .

three close-ups of Mr John R. Green's fully-restored Burrell 7 n.h.p. single-cylinder traction engine. Built in 1928 and exhibited at the Smithfield Show of that year,* FEARLESS *was the last traction engine to be turned out at the Thetford, Norfolk, Burrell Works. Many of the constructional details of the engine in its final form are revealed here.





AROUND THE RALLIES

A good year despite some inclement weather . . . that's how the enthusiasts feel about 1957

Camborne Rally

Pictures by B. A. Butt

TWENTY-SIX engines were in steam at the second West of England traction engine rally held at Lanvain Farm, Camborne. Opener was Bob Arnold—" Tom Forrest " of the BBC radio serial The Archers.

(*Continued overleaf*)

Right, top: On with the parade! A Fowler steam roller and two Burrell showman's engines get under way in fine style. Centre: Observe the fine workmanship in this standard main-line express passenger loco, BRITANNIA, *one of the individual models at the rally. Below: This celebrated 8 h.p. three-speed showman's road locomotive was built for Henry Strickland and Sons, of Worcester, in* 1907; *it is probably one of the most outstanding showman's engines in preservation*

Below: This Burrell was built in 1904 *and exhibited at the Royal Cornwall Show at Falmouth in that year. This engine is notable as having given rise to the present interest in steam road locomotion in Cornwall*

There were 11 Burrells (including three showmen's engines), two Aveling and Porter rollers with an A and P engine, a Ruston and Hornsby engine, two Marshall rollers with a Marshall engine, a Fowler engine and roller, a Wallis and Steevens engine, a Foden 5-ton steam wagon, a Garrett engine, a Sentinel steam wagon, two Robey tandem rollers, two Merryweather steam fire engines, a 3½ in. to 1 ft freelance model (based on a double-crank compound Burrell traction engine) and a 6 in. to 1 ft model, also freelance, incorporating a flash steam boiler working at 75 p.s.i. pressure.

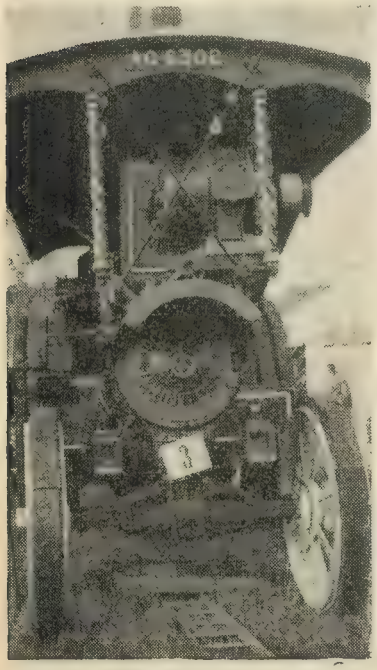
An outstanding engine was a Burrell which looked as though it had just left the works. All the levers were of stainless steel, and cut in the canopy above the crankshaft was a skylight.

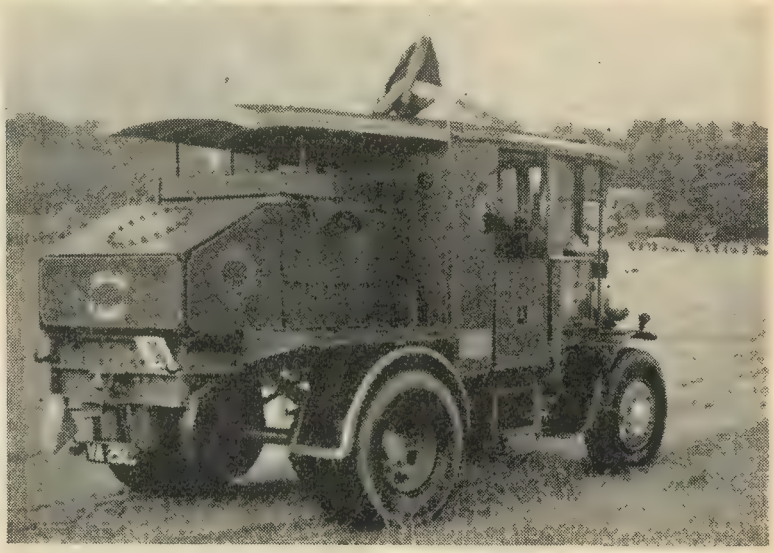
North of England

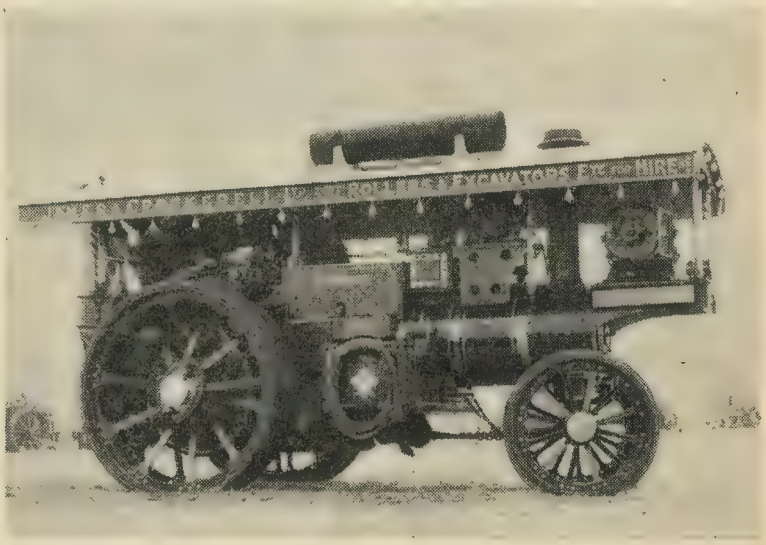
Pictures by F. S. Richards

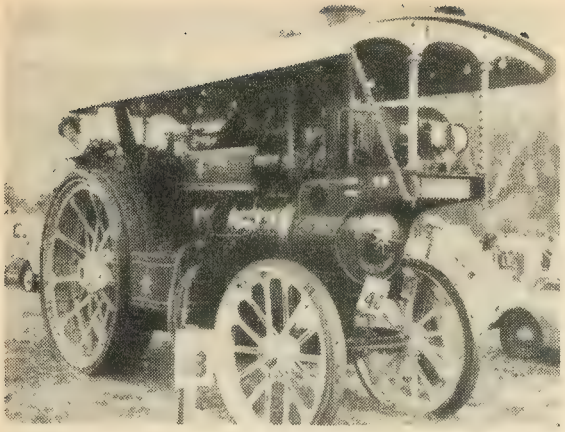
OWING to a torrential downpour just before the event, the ground at the North of England traction

LIGHTNING II—*a Burrell of 1913 vintage*









Above: *A Fowler showman's engine, built* 1919, *and owned by T. Sage, of Leicester*

Right: *An* 8 *h.p. compound Burrell in steam*

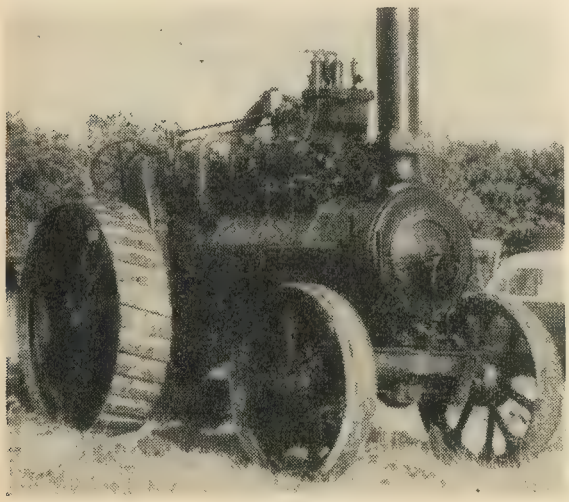
Top, left: *Some of the models exhibited at Camborne*

Centre, left: *J. G. Barrack, of Aberdeen, owns this Foden steam tractor* HIELAN' LADDIE

Bottom, left: *Still in tip-top condition is this* 1922 *Burrell* PRINCE OF WALES. *Owners are James and Crockerell Ltd, of Durrington, Wilts*

engine rally was deemed too soft to put the full programme into operation. About 30 engines were present together with Mr John Roehorn's mammoth Gavioli show organ, which provided ample scope for the enthusiast.

Below: *A Marshall compound engine—on show, but not in steam*



Elham Valley

Pictures by H. H. Pretty

BIG crowds gave a good send-off to the Elham Valley, Kent, steam engine rally staged by Pegden Brothers, who assembled 21 engines.

The show started with an obstacle race followed by musical chairs, "tilt the bucket" and an exciting tug-of-war between an Aveling and Porter eight h.p. compound engine and a seven h.p. Clayton engine. The latter won after a very close contest.

The rally ended with an exhibition of flying by Dover MAC and a parade of vintage cars.

Woburn Park

TRACTION ENGINE RALLY

Photographed by B. Mattimore

ROSE

LBSC gets down to the details of the fittings for the boiler of the beginners' locomotive

Continued from 26 September 1957, pages 448 to 450

Most of the water-tube boilers fitted to the commercially-made locomotives mentioned in my previous article had dry backheads. The inside boiler barrel was directly attached to a cast backhead, and as the water area was only equal to the diameter of the barrel, it was impossible to fit a water-gauge with an adequate length of glass, and direct large-bore passages.

They also had plug-cock regulators which either stuck or else leaked badly; and being screwed direct into the backhead, the steam inlet was so close to it that the surge of water when the engine started sent plenty of it down the steam pipe.

These troubles have been eliminated in the boiler for *Rose*. The entire surface of the backhead is in contact with water and is available for fittings. The regulator is an adaptation of a screwdown valve taking steam from near the middle of the boiler barrel, so is unaffected by surging. It can neither stick nor leak, and gives very fine adjustment of the supply of steam to the cylinder.

A standard type of water-gauge with ample length of glass is provided, and a blower of the type specified for *Zoe* can be fitted. The pipe passes through the water space. On the commercially-built engines mentioned above it passed through the casing, and when water went down the pipe, as it usually did, the effect resembled a person with a violent attack of sneezing.

REGULATOR

Use bronze, gunmetal or best quality brass rod for all the fittings. Chuck a piece of $\frac{5}{16}$ in. round, face the end and part off a $\frac{3}{4}$ in. length. Rechuck, centre, drill through with No 43 drill, open out and bottom to $\frac{1}{2}$ in. depth with 7/32 in. drill and D-bit, slightly countersink the end and tap $\frac{1}{4}$ in. × 40. Reverse in chuck and open out the other end to a bare $\frac{1}{8}$ in. depth with No 23 drill. Drill three No 50 holes in the side as close together as possible. Fit a $4\frac{1}{2}$ in. length of 5/32 in. copper tube with a few 5/32 in. × 40 threads on one end into the No 23 hole and silver solder it.

Chuck the $\frac{5}{16}$ in. rod again, centre and drill No 31 for $\frac{1}{2}$ in. depth. Turn down $\frac{3}{16}$ in. length to $\frac{1}{4}$ in. dia. and screw $\frac{1}{4}$ in. × 40. Part off at $\frac{3}{16}$ in. from the shoulder, reverse in the chuck, open out to a bare $\frac{1}{8}$ in. depth with a letter C or 15/64 in. drill, then tap the rest of the hole 5/32 in. × 32. Fit a 3 in. length of $\frac{1}{4}$ in. tube into the counterbore and silver solder it. This tube must have a hole through it large enough to pass a 5/32 in. rod. Run the tap through again after silver soldering.

Chuck a piece of $\frac{1}{2}$ in. rod, face, centre and drill No 21 for $\frac{3}{4}$ in. depth. Open out with letter C or 15/64 in. drill to a full $\frac{1}{8}$ in. depth. Turn down $\frac{1}{4}$ in. length to $\frac{3}{8}$ in. dia. and screw $\frac{3}{8}$ in. × 32. Part off at a bare $\frac{3}{8}$ in. from the shoulder, rechuck in a tapped bush, turn down 7/32 in. length to $\frac{1}{4}$ in. dia. and screw $\frac{1}{4}$ in. × 40. Fit this on the other end of the $\frac{1}{4}$ in. tube (see drawing) and silver solder it. After cleaning, screw the two halves together as shown.

The regulator rod is made from a piece of 5/32 in. rustless steel or drawn bronze rod $4\frac{5}{8}$ in. long. Turn one end down to 5/64 in. dia. for a full $\frac{1}{8}$ in. length and screw it 9 BA. File the next $\frac{1}{8}$ in. to a 3/32 in. square. Reverse in chuck, turn a blunt cone point on the end, screw the rod 5/32 in. × 32 for about $\frac{3}{4}$ in. length and turn away the threads for $\frac{1}{4}$ in. behind the point. Put this through the gland fitting and push it down until the threads engage with the tapped section of the regulator body. Screw it right home until the cone point seats in the D-bitted hole, as shown in the section.

The gland nut is made just the same as a union nut and needs no detailing. Pack it with a few strands of graphited yarn.

The handle is made by screwing two pieces of 3/32 in. steel into the ends of a $\frac{5}{16}$ in. length of $\frac{3}{16}$ in. square rod and bending the ends at right angles. This is the same kind of handle as used on the old GER engines. Drill a 3/32 in. hole through the middle of the square piece of rod, and file or drift it square to fit the squared section of the spindle. It is secured by a 9 BA nut.

The next job is to mark out the position of the fittings on the backhead, as shown in the drawing, and drill and tap the holes, also those in the smokebox end of the barrel. Make a mark on the flange of the regulator gland, opposite those in the valve body, then insert the regulator through the large tapped hole in the backhead, and screw it right home.

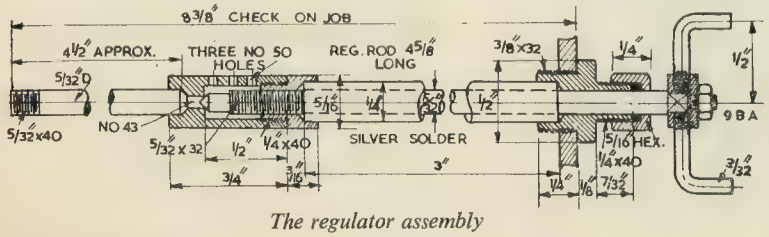
The holes in the body must be at the top, and the end of the steam pipe should just project through the upper hole in the front end plate. If the holes don't come right when the gland flange is screwed up hard against the backhead, put a soft copper washer of sufficient thickness to do the trick between the contact faces. A trial-and-error job ! Anoint the threads with plumbers' jointing as usual.

Mount the regulator handle on the rod so that when the valve is shut, the handle is top-right to bottom-left as shown in the view of the backhead. Turn anti-clockwise to open. Although the handle will clear the water-gauge and blower union, it shouldn't need turning as far as that. About one-third of a turn should pass enough steam for the engine to pull a good load at high speed.

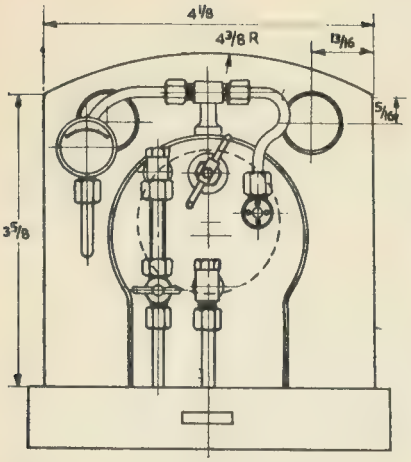
STEAM ELBOW AND SUPERHEATER

Chuck a piece of $\frac{3}{8}$ in. rod in the three-jaw, face, centre and drill to a bare $\frac{5}{8}$ in. depth with No 30. drill. Tap 5/32 in. × 40. Turn down $\frac{3}{16}$ in. length to $\frac{1}{4}$ in. dia. and screw $\frac{1}{4}$ in. × 40. Part off at $\frac{1}{2}$ in. from shoulder, drill a $\frac{3}{16}$ in. hole in the side at 7/32 in. from the blind end, and silver solder a $\frac{1}{4}$ in. × 40 union nipple into it.

Smear the outer threads with plumbers' jointing, also those on the end of the steam pipe projecting through the front plate, and screw the elbow on to the pipe, carrying on until the outer threads engage with

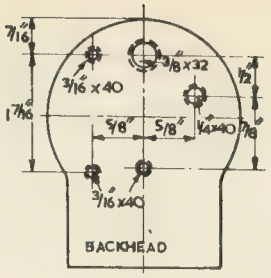


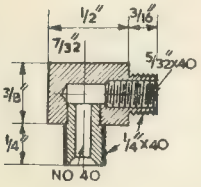
The regulator assembly



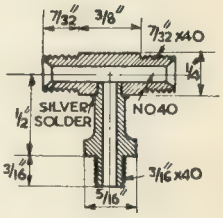
Left: Arrangement of footplate fittings

Right: Location of the holes for fittings





Left: Steam-pipe elbow



Right: The steam tee

those in the plate and the elbow is tight up against the plate. The union on the elbow should incline to your right.

The superheater is a piece of 5/32 in. copper tube 19 in. long, with a $\frac{1}{4}$ in. $\times$ 40 union nut and cone at each end. When silver soldering on the cones, heat the whole length of the pipe to red and put it in the pickle. Well wash afterwards, letting the water run through the pipe to shift any scale that might have formed.

Bend the pipe into a loop and insert it between the water-tubes and boiler barrel, then bend up one end at right angles and attach the nut to the steam elbow. The other end is bent to a swan-neck for attachment to the union at the top of the steam pipe on the cylinder. The whole arrangement was shown in the section of the boiler erected.

As the blower valve is the same as that specified for *Zoe* a separate drawing isn't necessary. The only difference in the whole bag of tricks is that the pipe inside the boiler is shorter, and the rawest recruit can measure the length of pipe needed from the actual boiler; 8$\frac{1}{4}$ in. should do it nicely. A short piece of $\frac{1}{8}$ in. tube, with a $\frac{1}{4}$ in. $\times$ 40 union nut and cone on the end, is attached to the thoroughfare nipple. The other end is bent into a curve to come alongside the blast nozzle when the boiler is erected. This end is screwed $\frac{1}{8}$ in. or 5 BA and furnished with a jet like a midget blast nozzle, the hole in it being drilled No 70.

TURRET AND STEAM GAUGE

For the turret or steam tee, chuck a piece of $\frac{1}{4}$ in. rod, face, centre deeply, turn down 7/32 in. length to 7/32 in. dia. and screw 7/32 in. $\times$ 40. Part off at $\frac{13}{16}$ in. from the end, reverse in chuck, repeat operations, and put a No 40 drill right through. Drill a $\frac{3}{16}$ in. hole in the middle. Chuck a piece of $\frac{5}{16}$ in. rod, face, centre, drill to $\frac{3}{4}$ in. depth with No 40 drill, turn down $\frac{3}{16}$ in. length to $\frac{3}{16}$ in. dia. and screw $\frac{3}{16}$ in. $\times$ 40.

Part off at $\frac{7}{16}$ in. from shoulder, rechuck in a tapped bush held in the three-jaw, turn the outside to shape shown, and turn $\frac{1}{16}$ in. of the end to a tight fit in the hole in the double union. Squeeze it in and silver solder it.

Drill a 5/32 in. hole through the backhead flange right above the regulator gland, penetrating the water space, and tap it $\frac{3}{16}$ in. $\times$ 40. Screw the stem of the tee into this. Connect the right-hand union to the one on the blower valve by a $\frac{1}{8}$ in. pipe with union nuts and cones on each end as shown in the illustration of footplate fittings. The left-hand union is connected by a $\frac{1}{8}$ in. pipe bent into an inverted swan-neck, to a $\frac{3}{4}$ in. pressure-gauge reading to 120 lb.

Note—a steam gauge is not really essential if the safety-valve is set to blow at 80 lb. when made. The boiler will make plenty of steam and as long as the safety-valve does its job, that's all you need worry about ! If the gauge isn't fitted, block the nipple with a union nut and a solid cone inside it. You may find it handy for fitting some other blob or gadget in due course.

WATER GAUGE

This type of water gauge was nicknamed George Washington in the early days of my notes because it always told the truth, which was more than could be claimed for the commercial gauges then on the market !

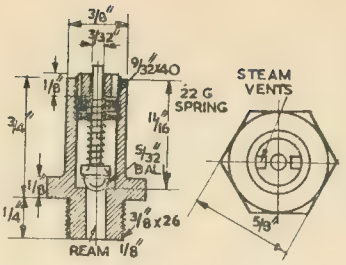
Chuck a bit of $\frac{1}{4}$ in. rod, face, centre, drill No 21 for $\frac{1}{2}$ in. depth, screw $\frac{1}{4}$ in. $\times$ 40 for 5/32 in. length, part off at $\frac{7}{16}$ in. from the end, reverse in chuck and tap the other end $\frac{3}{8}$ in. $\times$ 40 for about 5/32 in. depth. At $\frac{3}{16}$ in. from the top, drill a $\frac{5}{16}$ in. hole in the side and make a fitting to go in it just like the stem of the steam tee, but to the length shown.

Chuck a piece of $\frac{5}{16}$ in. rod, face, centre and drill to $\frac{5}{8}$ in. depth with No 40 drill. Turn down $\frac{3}{16}$ in. length to $\frac{3}{16}$ in. dia. and screw $\frac{3}{16}$ in. $\times$ 40. Part off at $\frac{7}{8}$ in. from shoulder, reverse in chuck, centre, drill No 48 until the drill breaks into the No 40 hole, open out and bottom with $\frac{3}{16}$ in. drill and D-bit to 9/32 in. depth and tap the end 7/32 in. $\times$ 40.

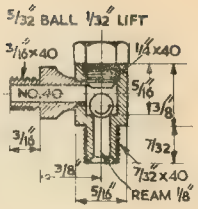
At $\frac{3}{8}$ in. from the screwed end drill a 5/32 in. hole into the central passage, and in it fit a $\frac{1}{4}$ in. $\times$ 40 nipple drilled No 40 and counterbored for $\frac{1}{8}$ in. down with No 21 drill. Directly opposite at 5/32 in. from the tapped end, drill another 5/32 in. hole and fit a $\frac{3}{16}$ in. $\times$ 40 union nipple in that one.

Silver solder all the joints at one fell swoop, then chuck a bit of $\frac{5}{16}$ in. hexagon rod, face, centre and drill No 40 for $\frac{3}{8}$ in. depth. Turn $\frac{1}{8}$ in. length to 7/32 in. dia. and screw 7/32 in. $\times$ 40. Part off at $\frac{5}{16}$ in. from the end, rechuck in a tapped bush, turn the end to a bevel and run a $\frac{1}{8}$ in. or 5 BA tap through the hole. Screw this into the tapped end of the bottom gauge fitting, and make a pin to fit by the same process as for the regulator valve but to sizes shown. The cross-handle is made from $\frac{1}{16}$ in. silver steel driven through a No 53 hole.

The top cap is turned from $\frac{1}{8}$ in. hexagon rod and needs no detailing, neither do the gland nuts, which are just like union nuts. Screw the fittings



Left: Safety valve



Right: The clackbox

into the tapped holes in the backhead with a taste of plumbers' jointing on the threads, and be sure that you get them in line.

A little judicious coaxing usually does the trick if they don't come right at first, but take care to avoid stripping the threads either on the fittings or in the soft copper. Far better to put a copper washer between the flanges and backhead. They are just right when a No 21 drill put down the upper fitting will drop straight into the counterbore in the bottom one of its own free will and accord.

A piece of glass tube 1⅛ in. long and 5/32 in. dia. is needed and can be cut from a longer piece by simply nicking with a file edge, and snapping off. Rubber packing rings are made by putting a piece of rubber tube over a piece of 5/32 in. rod held in the chuck. Try a nut on it, and if the nut won't go over the rubber, ease it down with fine glasspaper while the lathe is running full speed. Then apply a wet discarded safety-razor blade to the rubber tube at 3/32 in. intervals. Push the tube off the rod—and there are your rings !

Wet the glass and a couple of rings, put the glass down the top fitting, slip on a ring, then the two nuts back to back, then another ring. Push the glass down into the counterbore, slide the nuts to the fittings (they will take the rings with them) and screw home. They need be little more than fingertight as the glass expands when hot and moves in the fittings. Screw in the top cap and the valve pin, and the job is done.

CLACKBOX OR CHECK VALVE

Chuck a piece of 5/16 in. round rod, face, centre deeply with size E centre-drill, and drill No 34 for ¾ in. depth. Turn down 7/32 in. of the outside to 7/32 in. dia. and screw 7/32 in. × 40. Part off at ⅜ in. from shoulder, reverse in chuck, open out to 5/16 in. depth with 7/32 in. drill and D-bit, slightly countersink the end and tap ¼ in. × 40. Drill a 5/32 in. hole in the side and make a fitting for it like that in the top of the water-gauge. Silver solder it in. After cleaning up, run the tap in again, and put a ⅛ in. parallel reamer through the No 34 hole.

Seat a 5/32 in. rustless steel or phosphor-bronze ball on the reamed hole. The former can be made to form its own seating by putting a piece of rod on it and giving it one sharp crack with a hammer, but a bronze one won't stand that without defacing, so use an ordinary steel cycle ball to form a seating for it. Put a nut on the threads to prevent damage while performing the seating act.

Turn the cap from 5/16 in. hexagon rod, making it just long enough to allow the ball 1/32 in. lift. Bevel the end of the screwed section to give the water free access to the way out. Screw the stem of the clackbox into the hole in the middle of the backhead, taking the same precautions as before to have it vertical when screwed home tightly. The pipe connection is made after the boiler is erected.

SAFETY-VALVE

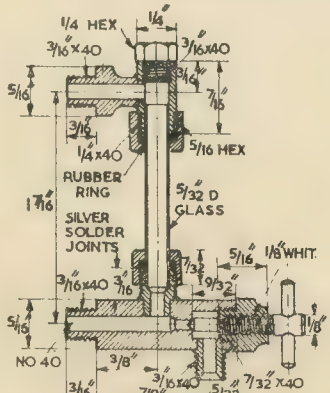
Chuck a piece of ⅝ in. hexagon rod in the three-jaw, face, centre and drill No 34 for 1⅛ in. depth. Turn ¼ in. length to ⅜ in. dia. and screw ⅜ in. × 26. Part off at ¾ in. from the shoulder, reverse and rechuck in a tapped bush, open out and bottom to 11/16 in. depth with ¼ in. drill and D-bit, tap the end 9/32 in. × 40 and put a ⅛ in. parallel reamer through the remains of the 34 hole. Seat a 5/32 in. ball on the hole, same as in the clackbox. Turn the outside to ⅜ in. dia. as shown.

Chuck a bit of 3/16 in. round rod, face the end and turn down ⅝ in. length to 3/32 in. dia. Part off at 3/32 in. from the shoulder, reverse in the chuck, skim the flange to 5/32 in. dia. and slightly countersink it so that it sits fairly on the ball. Chuck a piece of 5/16 in. rod, turn about ¼ in. of it to 9/32 in. dia. and screw it 9/32 in. × 40. Centre and drill No 40 for ¼ in. depth and part off a ⅛ in. slice. File a nick at each side with a warding file.

The spring is wound up from 22-gauge tinned steel wire over a piece of 3/32 in. steel wire held in the chuck. The ends should be square, to press fairly on the cup flange, so wind the ends closely and touch them on the side of a fast-running emery-wheel. The spring should just start to compress when the nipple is entered into the valve column.

The plug for the bush under the dome is made from ⅝ in. hexagon rod, the bottom being screwed same as the safety-valve. The boiler, with fittings attached, can then be slid into the outer casing and secured with a few 3/32 in. or 7 BA screws put through No 40 holes drilled in the edge of the casing into tapped holes in the backhead flange. As these will penetrate the water space, use brass screws, which should be a good fit in the holes, or preferably turn and screw them yourself from 5/32 in. bronze rod, and smear the threads with plumbers' jointing. Next stage, boiler erecting.

● *To be continued*



The water gauge

Catalogue received

READERS who are interested in locomotive photographs should obtain a copy of a new catalogue recently to hand from The Locomotive Publishing Company Ltd, Craven House, Hampton Court, Surrey.

The price is 2s. 0d., and some 5,000 subjects are listed, covering the period 1860 to 1930 for most English, Scottish, Welsh and Irish railways.

There is also a list of nearly 70 coloured postcards of pre-grouping locomotives and trains.

The oldest train in the show, headed by an 1856 *Beyer and Peacock,* PRINS AUGUST

Swedish State Railways

CENTENARY JUBILEE

Principal Dimensions of locos mentioned:

Locomotive:	Prins August	O.F.V.J.*
Wheel arrangement	2-4-0	0-4-2
Wheel-base ...	13 ft 7 in.	13 ft 3 in.
Wheel dia., driving	5 ft 6 in.	5 ft 1 in.
leading or trailing	3 ft 3 in.	3 ft 7 in.
Boiler, dia. ...	4 ft	3 ft 9 in.
heating surface	810 sq.ft	876 sq. ft
working pressure	120 lb./sq. in.	130 lb./sq. in.
Cylinders, bore ...	15½ in.	15 in.
stroke	20 in.	32 in.
Valve gear ...	Allan	Stephenson
Weight	26 tons	25 tons
Drawbar pull ...	5,660 lb.	6,830 lb.
Tender:		
Wheelbase ...	9 ft	9 ft 10 in.
Wheel dia. ...	3 ft 3 in.	3 ft 7 in.
Coal	3 tons	2 tons
Water	1,000 gal.	1,200 gal.
Built by	Beyer, Peacock & Co., Manchester	Sharp, Stewart & Co., Manchester
Year	1856	1876
Rebuilt	1886	—
	1956†	

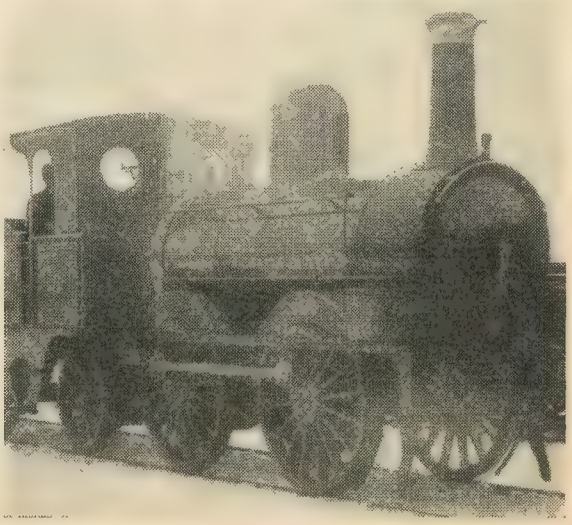
* Oxelosund, Flen and Vastmanlands Jarnvag (= Railway).
† Restored to original condition.

THREE entire trains representing periods of development in the railways of Sweden were exhibited at the centenary jubilee held by the Swedish State Railways last winter. The trains travelled through the country, their final destination Stockholm.

Mats A. Hede, of Stockholm, who sent the pictures on this page, reminds us that the first locomotives in his native land were of British origin, being built mostly by Beyer and Peacock, and Sharp, Stewart. ▣

Above: Breathing steam or sporting a beard?

Right : A Sharp, Stewart and Co. engine rebuilt with a Swedish cab



Below: Brass fittings of 100 *years ago gleam in the winter sun*

Unfinished locomotive

Why is an incomplete example of what promised to be a fine engine often left mouldering on the shelf? In this series R. M. EVANS, a member of Model Engineer workshop staff, will try to answer this problem

THE words "unfinished locomotive" have a forlorn and unpleasant ring about them. I hate to see them advertised or to hear them spoken. At the same time, I often wonder what happens to the locomotives and why their builders are unable to complete them.

Sometimes, perhaps, the builder finds the necessary technical skill beyond him, or that certain parts require machining operations beyond the capacity of his workshop. However, in my own opinion the most frequent cause is the time factor.

It certainly does take a long time to build a locomotive throughout, especially in 3½ in. or 5 in. gauge. And human nature being what it is, we tend to lose interest in the model long before we can get her on the rails; or we wish that we had made it an 0-6-0 goods rather than a 4-4-0 express type. Oh yes, I have to include myself among the guilty ones!

Now what can be done to speed things up, and so avoid the need for that small ad? The first and obvious answer is to build a fairly simple locomotive, and one that is well tried and proved. To tackle a four-cylinder Pacific straight away is asking for trouble, though I know some people do so, and complete the job.

The second answer is to use the quickest satisfactory process for each part of the model, and with this in mind I am making these few suggestions, which obviously are not directed at the experts.

Mainframes

Locomotive mainframes involve the easiest mental work but the hardest physical work of the whole job. When it comes to sawing out 2½ in. gauge frames or larger, I do think that high-speed hacksaw blades are worth while, and would strongly recommend anyone who can afford them to purchase two or three; they will last much longer than carbon-steel anyway. Those with 18 teeth to the inch are ideal for all but the heaviest frames.

The secret of effortless (if one can use such a word) hack-sawing is to use a long slow stroke, with plenty of weight on the cutting (forward) stroke, and plenty of cutting oil.

It is certainly worth trying to saw as close as possible to the scribed line, as it is here that heavy filing can be avoided. Another point, when drilling out wheel arches and other curved parts, use a drill about 3/32 in. dia. first, not drilling *too* close to the scribed line. Then a larger drill can be used to join the holes already drilled and so make possible the breaking away of the excess metal rather than having to saw into the row of holes once again.

Buffer beams

There is no doubt that the practice of welding or brazing the frames to the buffer beams saves a great deal of time, but many of us do not really like our frames to be permanently joined in this way, and there is always the risk of distortion. The usual method, of course, is to rivet fixing angles to the buffer beams, and tap these for attachment to the frames. But it is quicker to attach the frames to the fixing angles by screws put through from the outside, through both frames and angles, with nuts inside.

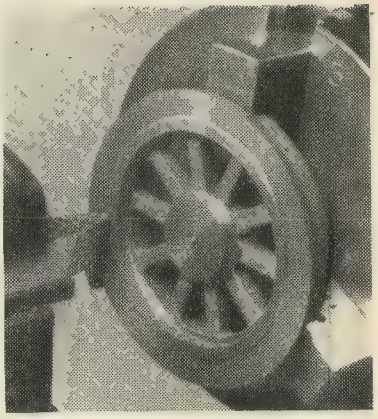
To take an example in 3½ in. gauge: three 4 BA steel cheesehead screws to each fixing angle would be quite strong enough. For the whole chassis this means 12 clearing holes against 16 tapped holes, a considerable saving.

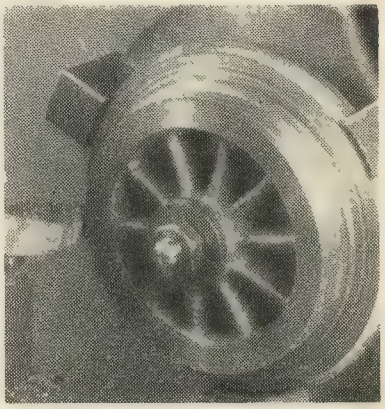
Hornblocks are nearly always riveted to the frames, but there is no reason why countersunk screws should not be used, put through from the outside with nuts inside, and with the "hot-pressed" horns available for most gauges from our advertisers, the fitting of these should be quite a quick and easy job.

Round stretchers are quickest to made and quite satisfactory. Another point—they don't prevent the fingers getting down between the frames to reach that awkward union nut! Where axle-driven pumps have to be fitted, the cast stretcher probably takes the least time, being a straightforward four-jaw job.

Wheels

I don't think LBSC's usual method can be beaten, but it is worth while to carry out each machining operation on all the wheels of both loco and tender before proceeding.





Method of wheel turning showing (above) first operation and (below) the second operation

Operation 1: chuck wheel by tread, back outwards, face, centre, drill and ream, also lightly countersink axle hole, and take a cut across the flange just to clean up.

Operation 2: mount a suitable backplate in the three-jaw, fix the stub mandrel to same, and mount each driving wheel in turn for machining flange, tread and rim. The same stub mandrel can now be used for the bogie and tender wheels by re-turning while still in position. A cut, however, will have to be taken off the outer diameter of the backplate so that the tool can clear the flanges of the smaller wheels.

Operation 3: chuck wheels by flange with face outwards (lightly, or flanges will be marked) and turn boss. There now remains only the rounding-off of the flanges, and the chamfer on the front edge of the wheel, between rim and tread, both of which can be done with a file (with handle on!).

●*This is the first of a short series of articles on this subject*

Do not forget the query coupon on the last page of this issue

READERS' QUERIES

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1.

Negotiating that curve

I have made a small 3½ in. gauge track for a 4-6-0 loco, but find that the engine derails at the curve. Could you give me the minimum radius for a 4-6-0 ? I have banked the track a little ; would more banking help ?—P.H., Plymouth.

▲ *The generally accepted minimum radius for a 3½ in. gauge 4-6-0 locomotive is 20 ft, but the engine could probably be persuaded to negotiate a 15 ft radius at reduced speed provided that there is sufficient freedom in the leading bogie. The fact that your engine derails at the curve suggests that the bogie is not free enough. It should not only be able to swivel about its main pin, but it should also be capable of sliding sideways at least ⅛ in. in a 3½ in. gauge engine each way. Banking the track does not help the matter in any way.*

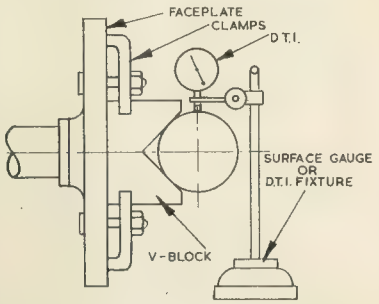
Marine power plant

I propose constructing a marine power plant. I find Mr Maude's boiler, described in ME for 18 April 1957, as being suitable for my purpose, but he omits to mention material thicknesses. Having no experience in the design of boilers, I would be grateful if you could give me some idea of the gauges to use. Failing this, is there any formula for calculating the thicknesses of boiler shells and tubes ?—G.B., Southampton.

▲ *The boiler described by Mr Maude would be suitable for your purpose and would undoubtedly steam efficiently. But it is rather an ambitious type of boiler for you to undertake if you have not had previous experience—and there are much simpler types that would be satisfactory for a practical marine plant.*

For a boiler of the size described by Mr Maude and working at a steam pressure not exceeding 100 p.s.i. you are recommended to use copper tube of 14 gauge thickness—approximately 3/32 in.—for the main drums with somewhat thicker material for the flanged endplates and 20-gauge tubes.

Formulas have been devised for calculating the thicknesses of boiler shells but it is difficult to find universally applicable formulas and, generally speaking, it is advisable to work to very high margins of safety to cover any eventualities, such as weakening of the boiler in use. In all cases boilers should be tested by hydraulic pressure up to not less than 50 per cent above normal working pressure before being put under steam.



Method for setting up work for accurate cross drilling

Diametrically-central hole

I would be much obliged if you could give me some help on the following :

In the production of a jig it is necessary to produce a ¼ in. reamed (or bored) hole, diametrically in a piece of ⅞ in. dia. round bar. The ¼ in. hole must be on the centre to ±0.0005 in. and accurately square to the centre line. The length of the ⅞ in. bar need be no more than 1½ in. and is not critical, and the lengthwise position of the ¼ in. hole can obviously be corrected.

Machines available are 3½ in. and 6½ in. lathes, an 8 in. power shaper and a ½ in. drill. My measuring equipment includes 0-4 in. micrometers, micrometer depth gauge, 6 in. vernier caliper, surface plate and d.t.i.—G.R.A., Luton, Beds.

▲ *There are several possible methods of attaining the accuracy desired, but the simplest with the particular equipment you have available would be to mount the bar in an accurate V-block or a Keats V-angle plate on the face plate of the lathe, using a method of clamping which will allow of access to the centre part of the bar.*

The face plate is turned to bring the bar into a horizontal position and a reading taken, with the dial test indicator supported in a suitable holder over the centre of the bar. It is then turned 180 deg. and the process repeated. The V-block is then shifted until the reading is exactly the same in both positions within the specified limits.

The drilling and boring operation is then carried out in the usual way by centre-drilling and boring or reaming, taking the usual precautions to ensure concentric accuracy.

Those bearings

I have renewed the rear-opposed cone bearings of an old-type lathe, using spun cast nickel iron for the outer and cast steel for the inner. The fit and finish seem satisfactory and the lathe appears happy with what must be modest clearances.

My first query is: can you venture a guess how long my bearings will last ? By way of comparison, a Myford ML7 has been in use for about six years and has not yet needed to be "de-shimmed." What would a similar amount of use be likely to do to my new bearings ?

Secondly, how were such bearings as mine finished after hardening before there were precision grinding machines and synthetic wheels—before, say, 1900 ?—A.M., West Kirby, Cheshire.

▲ *The life of the bearings will depend on quite a number of factors, including the amount of work and also the lubrication. But bearings of this type are generally employed more particularly for comparatively light-duty precision lathes, and for this purpose there is no reason why the bearings should not last indefinitely, especially as they are so readily adjusted for wear. Many lathes having bearings of this type have been found to last a lifetime with very little adjustment.*

It is difficult to say exactly what methods were used for finishing bearings before precision grinding machines were available, but it is more than likely that hand-finishing methods, such as scraping, were employed to a great extent. Lapping methods are possible with taper bearings and have, in fact, been employed to some extent. However, the method is not to use a replica of the tapered cone mandrel for lapping the bearings, but to use a cylindrical lap presented to one side of the cone bearings at the angle of taper and rotated slowly against the rotation of the bearing.

UNUSUAL LOCOS . . .

The Baldwin Camel-backs of 1897

Odd-looking, maybe, but what a reputation for time !

By ERNEST F. CARTER

CONSTRUCTED by Baldwin's between 1888 and 1897 at their famous locomotive works at Philadelphia, Pennsylvania, these unconventional Camel-back engines were Vauclain compounds in which the four cylinders were disposed in pairs—each high-pressure cylinder being placed above the corresponding low-pressure one, the two piston rods of each pair being connected to the same crosshead.

The cylinders were 13 in. and 22 in. × 26 in. and were fed from a 4 ft 10¾ in. dia. boiler containing 278 1¾ in. tubes 13 ft in length. With a firebox 9 ft 5⅞ in. long × 8 ft wide, a total heating surface of 1,835 sq. ft was available of which the firebox provided 136 sq. ft, the tubes 1,645 sq. ft and the combustion chamber 54 sq. ft. The grate, which was specifically designed to burn anthracite, had an area of 80 sq. ft.

Midships cab

Such a large grate necessitated a firebox which extended laterally over the main frames to the extreme limit of the loading gauge, and the firing was carried out from the tender foot-plate, the driver being accommodated in a cab perched amidships on the boiler in front of the firebox.

Of a total wheelbase of 26 ft 7 in. the driving wheelbase accounted for 7 ft 3 in. The weight of the locomotive alone was 71 tons 9 cwt, of which 39 tons 6 cwt was carried by the four driving wheels. The eight-wheeled tender carried 4,000 gallons of water and ten tons of anthracite.

These engines made a high reputation for themselves for keeping faith with passengers as to time, for in the summer of 1897 the Philadelphia and Reading Railroad placed a very fast train on its Atlantic City Division, allowing only 52 minutes for the 55½-mile run from Camden to Atlantic City.

On this 200-ton train the records show that for the 52 days from 2 July to 31 August 1897, the average time on the full run was a mere 48 minutes —equal to an average start-to-stop speed of 65 m.p.h. On one occasion —on August 14—the distance was covered in 46½ minutes, equal to a speed of 71.6 m p.h. !

The service became so popular that additional trains running to equally tight schedules were subsequently added, and it is worth mentioning that at the time even the best engines in England found it hard to excel the performance of these Camel-backs with their 7 ft ¼ in. drivers.

THE FLEXIBLE DRIVING WHEEL BASE LOCOMOTIVES

Another extremely unconventional type of locomotive which Matthias Baldwin—the one-time jeweller of Philadelphia—was responsible for designing was an 0-8-0 engine with a flexible wheelbase. The idea of coupling six or eight driving wheels

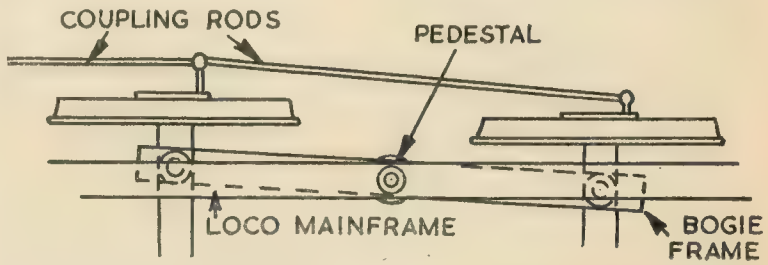
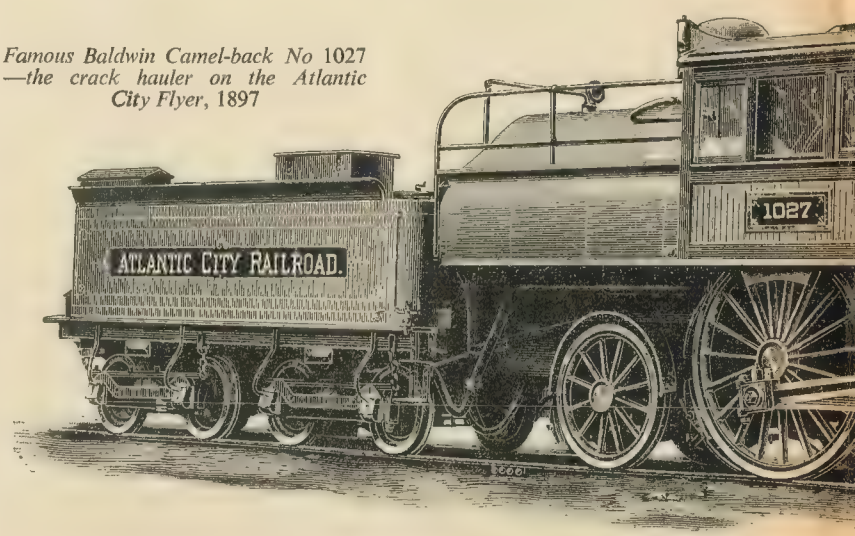


Diagram of Baldwin's patent flexible driving wheel bogie on an exaggerated curve

Famous Baldwin Camel-back No 1027 *—the crack hauler on the Atlantic City Flyer*, 1897



had long before been adopted in England, but the short radius curves prevailing on American railways decided Baldwin that the wheels should not only be coupled, but should at the same time be free in some way or other to conform to curved track in the freest possible way.

Now a flexible bogie having its wheels coupled by rods to one or more pairs of rigid driving wheels sounds like a mechanical anomaly, but that was what Baldwin introduced into locomotive practice in 1842.

The engine was arranged with the rear pairs of driving wheels placed rigidly in the frames behind the firebox with inside bearings, the cylinders being inclined alongside the smokebox with outside connecting-rods. The remaining four wheels and inside bearings running in boxes were held by two wide deep wrought-iron beams—one on each side of the engine. These beams were unconnected and entirely independent of each other, and the pedestals formed in them were bored out to receive cylindrical axleboxes.

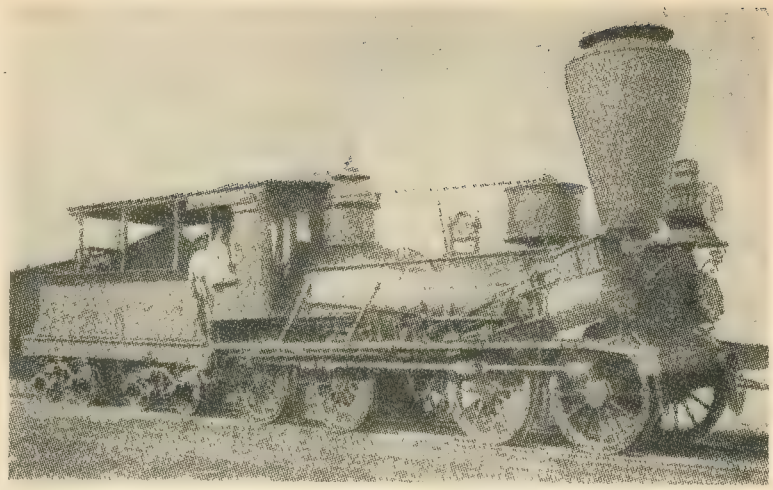
Independent movement

The engine frame on each side was directly over the beam, and a spherical pin, running down from the main frame, bore in a socket in the beam midway between the two bogie axles. It will thus be appreciated that each side beam could independently turn horizontally and vertically underneath the spherical pin, and the cylindrical axleboxes could also turn freely in the pedestals.

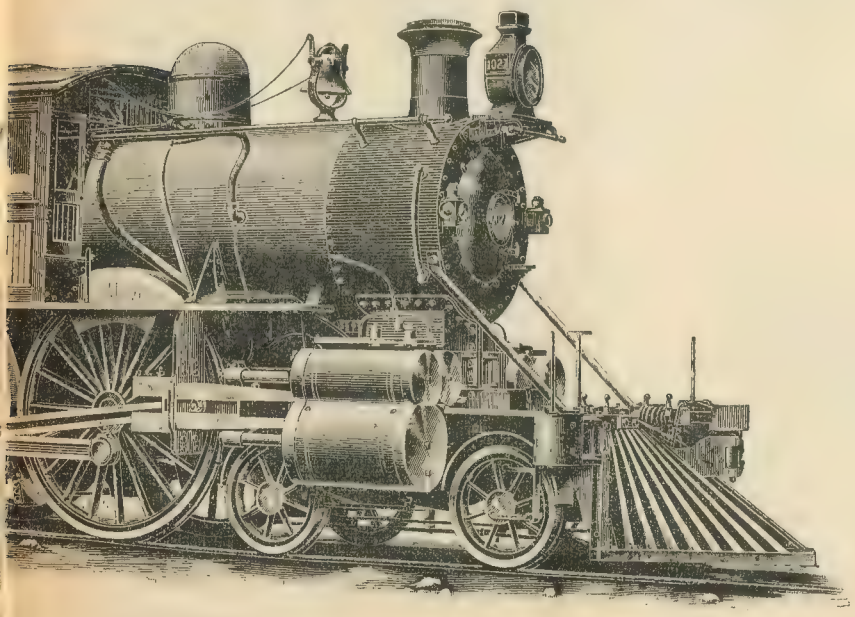
Hence, in rounding a curve, the middle pair of drivers could move laterally in one direction—say to the right—while the front pair could move in the opposite direction, the two axles all the while remaining parallel to each other and to the rear driving-wheel axle. In effect, the operation of the beams was similar to that of a parallel ruler, for on a straight line they and the two axles formed a rectangle, and on curves, a parallelogram.

The coupling rods were made with ball-and-socket joints which enabled them to accommodate lateral movement in the wheels mounted in the bogie.

Geometrically, of course, this combination of wheels could only work properly around curves by varying the length of the rods coupling the fixed pair of drivers with the rear pair on the bogie. But in practice it was found that with a 4 ft long beam on the bogie frame and 5 ft coupling rods from it to the fixed rear driving wheels, the total shortening or lengthening of the coupling rods to allow the rear wheels of the bogie to move sideways by one inch was less than 1/32 in. This enabled the engine to negotiate a 100 ft radius curve without flange binding.



Old Cuban locomotive with Baldwin's flexible driving wheelbase, 1905



Phenomenal power

The first engine built to this plan was finished in December 1842. It was the first of 14, and was delivered to the Georgia Central Railroad, where despite its light weight of 12 tons, it hauled 250 ton trains with ease up grades of 36 ft to the mile. On the Philadelphia and Reading Railroad, too, an 18 ton version of the same engine drew 150 cars loaded to a gross 1,130 tons from Schuykill Harbour to Philadelphia at an average speed of 15 m.p.h., and, notwithstanding its long wheelbase, easily negotiated curves of less than four chains radius.

The flexible driving-wheel arrangement enabled the Baldwin Locomotive Works to take a prominent part in the introduction of multi-coupled engines. They eventually had to adopt the independent bogie, though Mr Baldwin opposed it for many years.

A striking tribute to the extraordinary durability of Baldwin flexible-driver engines is shown in the old Cuban locomotive illustrated. Built in 1847 for the Havana and Guines Railroad it was still at work in 1905. ▣

A spherical turning attachment

DUPLEX now concludes his instructions for making this accessory

To complete the construction of the attachment I will now describe how to make and fit the device for setting the tool to a given radius, with reference to a graduated scale that is mounted on a slide bar attached to the tool-post sleeve. The layout of the components is shown in Fig. 16.

The bar *Q* carrying the sliding scale is threaded $\frac{1}{8}$ in. × 40 t.p.i. where it screws into the sleeve and at its other end it is threaded $\frac{3}{16}$ in. × 40 t.p.i. for the nut that clamps the bracket *K* in place.

To ensure that the scale slides freely when making adjustments, it is advisable to finish the bar by making a few passages over the surface with a lap charged with fine-grain abrasive.

The bracket carrying the screw for setting the tool-bit is made from $\frac{5}{16}$ in. × $\frac{5}{16}$ in. flat mild steel which is drilled $\frac{3}{16}$ in. dia. and nutted up in place on the bar. The upper, threaded hole for the feed screw should be drilled at a later stage to make sure that it is correctly located in line with the tool.

As the type of tool-bit used has an oblique end-face, the thimble *P* is fitted to this end and retained in place with a 6 BA setscrew so as to form an abutment for the tip of the feed screw. As shown in the drawing, the flange machined at the open end of the thimble is filed back to form an index pointer for reading the setting of the graduated scale. At its outer end the thimble is drilled with a centre-drill to receive the conical end of the feed screw.

At this stage the tool-bit with its thimble is clamped in place in the tool post, and the bracket and scale bar are assembled in position to enable the centre for the feed screw to be marked out. This operation is carried out by standing the tool-post assembly on the surface plate and setting the scriber of the surface gauge to the centre of the conical recess drilled in the thimble.

At this setting a line is scribed across the face of the bracket and the cross-centre line is scribed with the jenny calipers to mark the centre of the hole which is tapped $\frac{3}{16}$ in. × 40 t.p.i.

THE TOOL SETTING SCREW

To machine the feed screw *M*, a length of $\frac{1}{4}$ in. dia. steel rod, supported by the tail-stock centre, is turned down to $\frac{3}{16}$ in. dia. and afterwards threaded $\frac{3}{16}$ in. × 40 t.p.i. either by means of a tail-stock threading attachment or by using a die holder furnished with a guide collet. Cutting a thread with an unguided die is a rather chancy affair and one hardly to be relied on for this purpose.

The feed screw is next centred in the four-jaw chuck with the aid of the test indicator and the point is turned to an included angle of 60 deg. by setting over the top slide. To finish the part it is mounted in the lathe tool-post jig for cutting the screwdriver slot with a circular slitting saw mounted on an arbor between centres.

This machining operation is usually quicker than using a hand hacksaw and the slot is then accurately centred. The tail end of the screw is fitted with a threaded, knurled finger-nut which is secured with a 6 BA grub-screw bearing on a brass pad-piece.

The rear face of the finger-nut is engraved with five equally-spaced index lines to enable the tool-bit to be adjusted by increments of less than 5 thou when setting the machining radius of the appliance. The engraving is carried out with a sharp-point V-tool, secured on its side at centre height in the lathe tool post.

The work is then indexed from a change wheel which is mounted on the tail of the mandrel and controlled by a detent fixed to the lathe quadrant.

THE GRADUATED SCALE

The scale *N* was made from a length of $\frac{1}{2}$ in. × $\frac{3}{4}$ in. mild-steel bar which was drilled and reamed to a close sliding fit on the scale bar where, after adjustment, it can be secured by means of a 6 BA grub-screw fitted with a pad-piece.

After the contours have been formed by filing, or in the milling machine or shaper, the part is finished by engraving the scale graduation lines. This can be readily done by adopting the type of set-up illustrated in Fig. 21. Here, the milling slide is set vertically and the work is gripped in the machine vice with the fixed jaw aligned vertically by means of a square resting on the lathe bed.

Fig. 16: *The device for setting the tool*

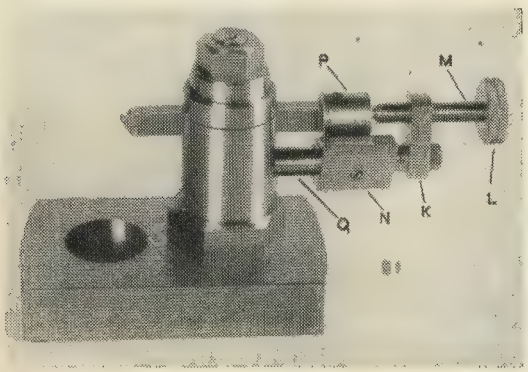
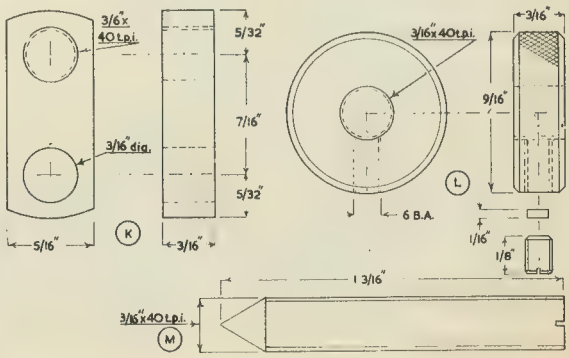
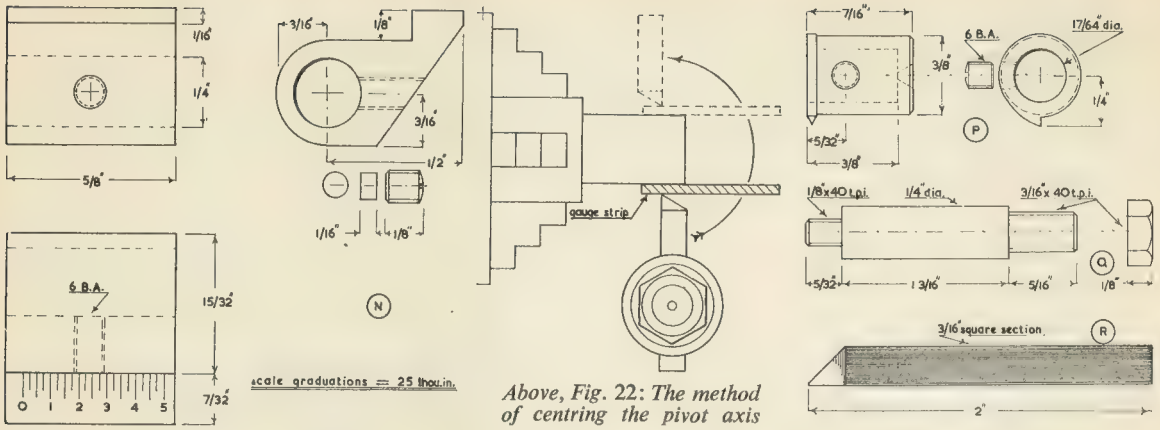


Fig. 18: *The feed screw and its components*





Above, Fig. 22: The method of centring the pivot axis

Left, Fig. 19: The graduated scale

Right, Fig. 20: The tool thimble, scale bar and tool-bit

After the lathe mandrel has been locked, a round tool-bit with a sharp 45 deg. point is set up in the chuck. The vertical slide illustrated was made from castings in the workshop with a Drummond hand shaper and the $\frac{3}{8}$ in. dia. feed screw was screwcut with a 20 t.p.i. V-thread to enable fine settings to be made with reference to the adjustable index collar.

Although a square or Acme thread is regarded as essential for commercial work, feed screws with a V-thread will be found satisfactory for many purposes in the small workshop.

After the attachment has been set square with the lathe axis, the slide is lowered to bring the tool into line with the position of the uppermost scale line and in contact with the face of the work. This is done to eliminate any backlash in the feed mechanism by the action of the weight of the slide itself as it is moved progressively upwards to cut the series of graduations.

To avoid damaging the fine point of the tool, the lines are cut to depth in two stages of 2 thou by feeding the lathe saddle forward with reference to the leadscrew index. The length of the individual lines is controlled by referring to the cross-slide index and alternate long and short lines—spaced at 25 thou apart—are engraved for easy reading of the scale.

After all the graduations have been cut in accordance with the drawing, the scale numerals are punched with hand stamps to represent increments of 0.1 in., and the burrs set up are afterwards removed with a dead-smooth file before the engraved surface is finally polished.

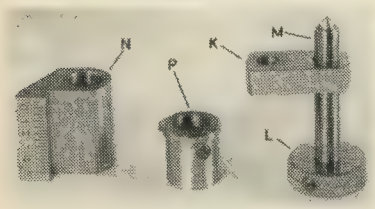


Fig. 17: The scale, tool thimble and adjusting screw

OPERATING THE ATTACHMENT

The square-section tool-bit is ground to the form of a right-hand knife tool with a point angle of some 60 deg. and, when mounted in place, the tool must have its cutting edge at exactly centre height for accurate machining. An adjustment in this respect can be made either by raising the tool with a strip of shim metal or by machining the lower surface of the tool-post sleeve to reduce the height of the tool.

With the setting gauge mounted on the pivot bolt, the tool point is brought into contact with the 0.400 in. dia. register and the scale is set to read 0.2 in. to indicate the machining radius. At the same time the knurled finger-nut is secured to the feed screw with the zero mark uppermost.

These settings will enable spherical surfaces of any required diameter to be machined and, in the same way, hollow spherical surfaces can be turned to a given radius by setting the tool point for the appropriate distance beyond the pivot axis.

The next step is to set the pivot axis in line with the lathe axis. This is done, as shown in Fig. 22, by machining a short length of rod gripped in the lathe chuck and then setting the tool point in contact with a feeler gauge held against the work; this setting is made by feeding the cross-slide inwards.

The tool is next swung through 180 deg. and the gauge is again applied. When the gauge shows that these two distances are equal, the pivot axis is correctly set and a reference line is scribed across both the cross slide and its base.

These reference lines are marked by stamping the numeral 0 at either end. To turn a ball-end on a rod the tool is set at right angles to the work and a short distance from its end and, by means of the operating handle, the tool is moved along a circular path. Meanwhile, the cut is put on by feeding the cross slide inwards and this is continued until the scribed reference lines come into exact alignment to complete the machining.

It may be found that to enable the operating handle to clear the chuck jaws, the tool post has to be rotated on its base and then reclamped, but this will in no way affect the accuracy of the machining operation. ■

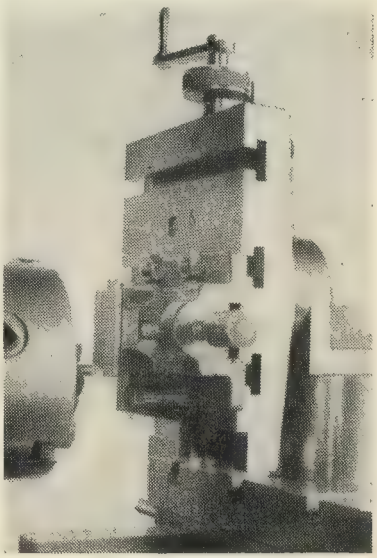


Fig. 21: Cutting the scale graduation lines in the lathe

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

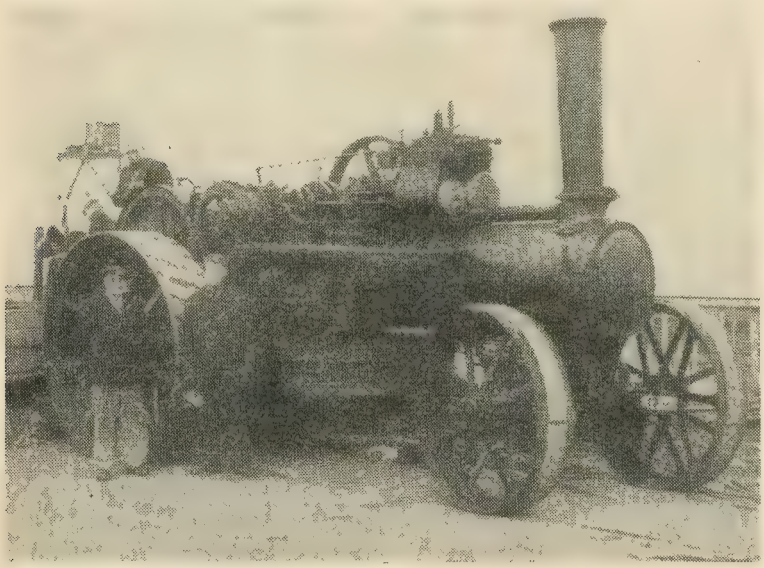
SOLE SURVIVOR?

SIR,—The Fowler ploughing engine No 13422 shown in my photograph is named *Sunshine*. She is a class KKS 12 h.p. compound—believed to be the only one of her type left.

She differs from some of the other types insomuch as she is a lighter engine and is fitted with a pump and injector and also a differential gear on the rear axle. She was delivered new to Messrs Buicks, in Kent, in 1912 and was later acquired by Wingham Engineering Co., Wingham, Kent, along with her sister engine and did quite a lot of work for them.

Knowing that Mr Hills, of Broxbourne, wanted an engine for preservation I put him in touch with her owners. He bought her in February and we started work to get her into shape. We found out that the tubes were useless and after waiting for 14 weeks we got a new set fitted.

In the meantime we spent most weekends on her getting the pump and injector cleaned out, the tank thoroughly cleaned, and all joints renewed till it came to steaming her up. The boiler inspector gave her a cold test up to 250 lb. and later gave her a steam test up to 300 lb., and all was well.



The Fowler ploughing engine whose checquered history Mr Barker describes on this page

During World War II she was sold to Wirksworth Quarries Ltd, London, and was delivered to St Ives, Hunts, where she drove an asphalt plant. While there she had a dry patch taken off the firebox side and a wet patch fitted in its place. I was in charge of the plant and drove her into Fowlers works where the work was carried out.

She was used on the plant till it was electrified and then she was moved to the owner's Woolmer Green Depot, Herts, where she stood for ten years.

So after working on her and cleaning her we got her on the road after about four months. We took her 25 miles to Broxbourne, where her new owner painted her up. He decided to take her to Woburn Park for the August Bank Holiday rally, which turned out to be the biggest rally that has been held in this country, 42 engines, with 20,000 people, attending.

The journey there and back was 88 miles and she was no trouble whatever. She averaged four to five miles per hour—not so bad for an engine without springs—and she was most economical on coal and water.

The personnel in the photograph are all MODEL ENGINEER readers: F. Barker, driver on footplate; F. Clarke, Wormley, Herts, who owns the last Tasker tractor made; S. Hills, the owner.

Thanks, incidentally, for a good Model Exhibition, which we all attended.

Welwyn, F. W. BARKER.
Herts.

PICKERING GOVERNOR

SIR,—Mr Hughes is to be congratulated on the pleasing design and method of constructing the Pickering governor for the traction engine he described in your issues of July 18 and 25.

As the governor worked, the fluctuations in speed caused the ghost-like solid traced by the revolving springs and balls to change in shape, and considerable flexure of the springs was constantly taking place, which, in my opinion, was rather severe. The makers met this by gripping the spring between the halves of the balls at the centre only and deepening the groove in the inner half ball gradually towards the ball's circumference so that the spring did not flex abruptly at the outline of the ball as shown by the curved line on the ball in section on the accompanying drawing.

Here my congratulatory theme must end for the throttle valve shown by Mr Hughes is in no way like those fitted to the full-size governor and in design is entirely unsuitable for any type of governor. For the Pickering type, which is a design of limited power, the throttle valve must offer the minimum of resistance in all parts of its travel and, therefore, it must be of the equilibrium type.

That shown by Mr Hughes is only in equilibrium when full open but when the governor operates to check the engine speed the valve, as it approaches its seat, goes out of balance with the rush of steam through the restricted opening and will take charge and close itself completely, being held there, with a boiler pressure of 80 p.s.i., by a force of 5 lb; scaling the bore of the valve seat as 9/32 in. dia. The valve design causes very erratic running of any engine it is fitted to.

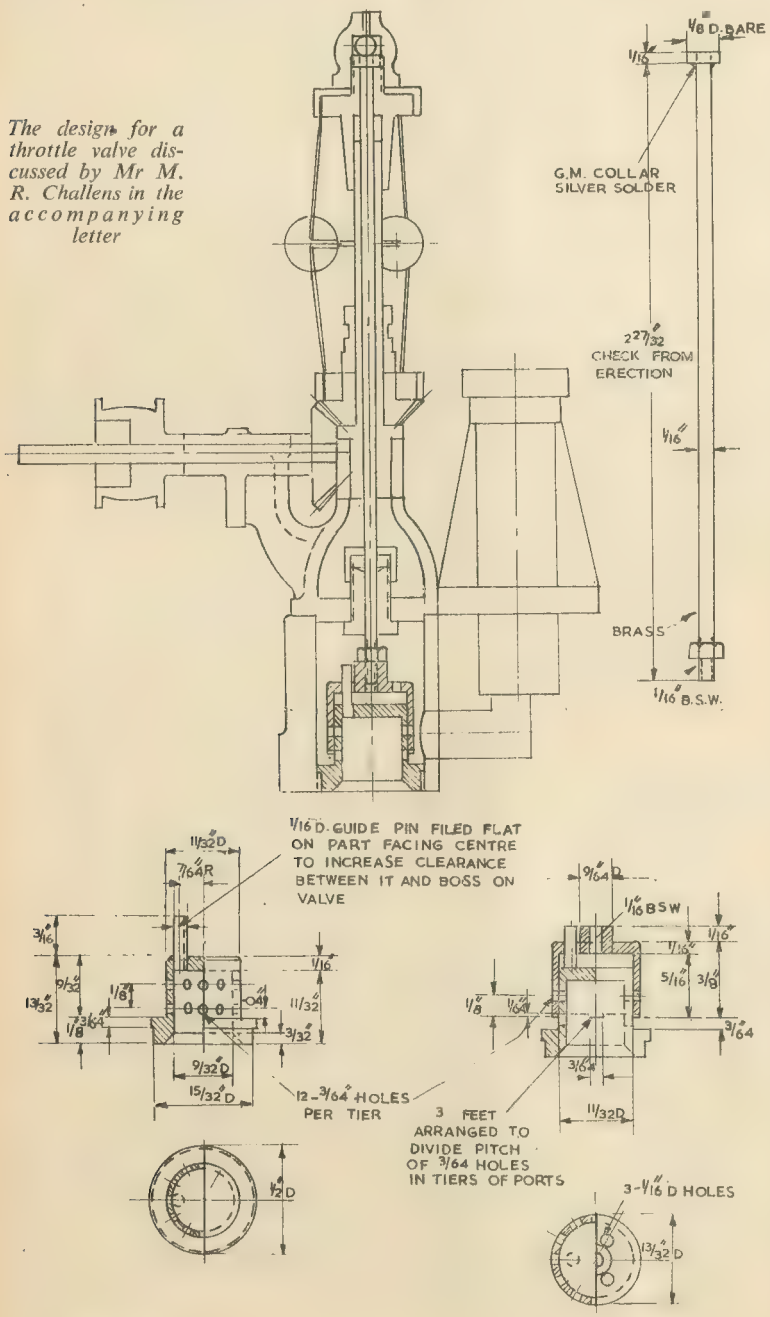
I submit a design of throttle valve that in essentials follows the original in that it is in balance at all positions of its travel except for the pressure of the steam on the area of the valve rod which at 80 p.s.i. amounts to 3.93 oz. This helps to support the valve and its spindle against gravity. This small amount of out-of-balance is inherent in all equilibrium valve designs where the valve spindle is not, at its other end, brought outside the valve casing again generally via a stuffing box.

A modification of the chamber into which the seat fits will be required as shown and the seat should be a *light* press fit and should be pushed home smeared externally with red lead in linseed oil.

To ensure correct registering of the upper tier of holes in the valve seat with the tier of holes in the valve when the latter is fully open, a guide pin is fitted to the top of the seat and passes through one of the three steam admission ports drilled around the valve spindle boss on the valve. Careful drilling of all these holes in their relative positions will be important and the hole used by the guide pin must be marked to ensure its use each time the valve and seat have to be assembled.

The steam areas around and through the valve have been designed to suit a 7/32 in. dia. steam pipe and the working range of 3/64 in. for the valve travel has been accepted as that suitable for the governor.

Newport, Mon. M. R. CHALLENS.



The design for a throttle valve discussed by Mr M. R. Challens in the accompanying letter

CATALOGUES WANTED

SIR,—I am an ex-modeller from the Old Country, resident here for seven years, and I am enlisting your aid in trying to obtain any catalogues relative to ship and locomotive modelling.

Modelling here is on the slow side, and, regarding racing yachts, these are mainly ready cut kits of English origin.

I have with me a part-finished 72 in. boat and experience great difficulty in getting fittings; consequently my own efforts at producing these are long and tedious. I commenced the boat before going back into the Services in 1939.

The boy I intended it for is now 19 years old and six feet tall! But I can finish it for my youngest boy.

The plans were lost years ago, so if anyone can help with any old catalogues I would be deeply appreciative.

We have plenty of sailing room here. There are two rivers, one tidal, and the sea is only 18 miles away.

Hadspen, Tasmania. E. J. LOWE.

ALL IN THE SERVICE

SIR,—Many thanks to all those who kindly sent replies concerning my query about *Loch Ard*, especially V. J. O'Toole of Geelong, Australia, and to L. H. Braybrook also of Australia, both of whom sent cuttings from Australian papers showing photographs of the ship herself and the graves of the victims of the disaster to this vessel.

All this goes to show the world-wide circulation of MODEL ENGINEER, and the comradeship that exists among its readers.

All this was brought about by a very dear old lady for whom I painted a picture of a sailing ship.

She turned out to be the granddaughter of the chief steward-cum-doctor-cum-parson of the *Loch Ard*, who, of course, lost his life, and it was on her behalf I instituted in-

POSTBAG . . .

quiries, as all the information the lady had was lost during the bombing of London, and now, thanks to the ME, it has all been replaced through the generosity of its readers.

I shall also paint her a picture of this ill-fated vessel based on Mr O'Toole's fine photograph in the *Geelong Advertiser*.

Northampton. F. J. ROCHE.

STEAM ENGINE DESIGN

SIR,—I was very interested in the comments by Harold A. Illingworth on the need for a robust small-power steam engine, as I have been interested in the design of small power units of all types for many years, and have had a good deal of experience in their practical development. The possible sources of mechanical power in small "packages" are by no means as fully exploited as they might be, and in common with Mr Illingworth and many others I have often felt that the small steam plant has a definite place in this scheme.

Unfortunately, the industrial world does not seem to agree with us, and nobody can arouse much commercial enthusiasm for a small steam plant. The fact is that this particular motive power does not readily lend itself to mass production and, moreover, most people believe—rightly or wrongly—that steam plants require too much supervision and maintenance to be worth bothering about. Unless it can be definitely shown that such objections to steam are fallacious, by producing a simple, reliable, fully automatic and inexpensive steam plant, I do not see much prospect of success in this venture.

The results produced in recent years by very expensive research work are, in my opinion, very disappointing; I am not at all impressed by the plant referred to by Mr Illingworth, despite the publicity it received when first introduced. Nothing more has been heard of it, so one may presume that it has not been put into commercial production.

Mr Illingworth suggests, though he does not actually insist, that a single design of engine could be produced to suit almost any duty equally well; but I consider that in order to obtain reasonable efficiency engines must always be designed for the specific job they have to do. A general-purpose engine may do widely varied jobs, but not so efficiently as to compete with other forms of motive power. The idea of designing an engine so as to "work in" standard automobile or motorcycle parts fills me with horror !—I have had some, thank you !

There would be no major difficulty in designing an engine or complete steam plant to conform with the suggested specification, and I know of several firms who would be happy to undertake a contract for producing it. But it is one thing to design an engine, and another to develop it. The latter, despite all the exact theoretical knowledge available, can be and often is a very costly job; engines are rarely produced straight off the drawing board with "all the bugs ironed out" as they say in the test shop.

I am sorry if I sound pessimistic, but facts have to be faced, and one cannot solve problems by ignoring them. However, I wish Mr Illingworth every success in his quest, and would certainly like to see the idea followed up in ME—which is the only journal likely to find enthusiastic support for it.

EDGAR T. WESTBURY.

CLUB NEWS

Edited by THE CLUBMAN

TO preserve historic examples of steam locomotives and to try to prevent the closure of lines by advocating sound methods for making them pay: these are the principal objects of the newly-formed Railway and Steam Locomotive Preservation Society.

"We also advocate the retention and development of steam power on the railways of Britain," writes secretary R. A. Spencer (Rye Croft, South Hatfield, Herts). "The ultimate object of the society will be to take over and run a passenger service on a branch line, or lines. This will give members a fine chance to get familiar with steam power." The lines would also provide an opportunity for non-static displays of historic locomotives.

Most readers will agree, I think, that the RSLPS stands a better chance of success with its aim of taking over a branch line than with its hope of deflecting British Railways from a programme costing £1,240,000,000.

There was a rush at the Model Engineer Exhibition for back numbers of the issue featuring the Seashore Electric Railway in New England, which shows what can be done on full-scale lines by men who wish to preserve, as far as they can, an older method of transport. Something of the kind of enthusiasm and the same willingness for hard work might be successfully attempted in England with the same success. Looking nostalgically at old lines does nothing to preserve them.

I am sure that Mr Spencer can expect a full postbag from readers.

NEW TROPHY

To encourage inter-club competition, **Blackheath MPBC** (as was mentioned here earlier) has introduced the Cleary Trophy, a shield for which teams of three from each affiliated club were invited to compete simultaneously with the steering contest at Blackheath Regatta on September 15.

The rules lay down that no club shall substitute a craft for another. Whichever club gets the most points in a maximum of 45 holds the trophy for twelve months. Should a tie occur, each craft (it is proposed) would be allowed another run.

Secretary A. A. Rayman of Blackheath MPBC lives at 84 Honor Oak Road, Forest Hill, London, SE23.

ME DIARY

October 12 JIE paper "The Problem of O and M Study," W. J. Kease, 7 p.m.
Glasgow SME Bits and Pieces night.

October 13 IRCMS at Kingsley Hotel, London.

October 16 Chester MRC sixth annual exhibition, Chester Town Hall (October, 16-19).
Birmingham SME, Bits and Pieces Night, White House.

October 18 Birmingham SMS "A Doctor Afloat," Dr Stanley Wood, Imperial Hotel, Temple Street, Birmingham, 7.30 p.m.
Rochdale SMEE general meeting, Lea Hall, 7.30 p.m.

October 19 Warrington MES track day, Earlstown near Warrington.
Chester show ends.
JIE paper, "Oil Additives," S. E. Holmes, 7 p.m.

October 20 MRCA Bath: National Championship, open; Bath Mini-Car Club, Drill Hall, Lower Bristol Road, Bath.

October 26 Scottish Model Engineering Exhibition, Christian Institute, 70 Bothwell Street, Glasgow, 10 a.m. to 10 p.m. (October 27-November 2, 11 a.m. to 10 p.m.).
Bristol SMC "Ships in Miniature," Bristol Museum and Art Gallery, last day.
Institution of Engineering Designers, visit to Huwood Mining Machinery Ltd., 9.30 a.m.

WE SPECIALISE

IN EVERYTHING FOR THE MODEL ENGINEER

Myford, Zyto, E.W., Emco-Unimat Lathes, Bridges, Wolf, B & D Units Brook Motors, Plans, Materials, Tools, & Burnerd Chucks from stock.

"Caley" universal cutting oil 2/-. Post 1/-.
"Caley" super steam oil 2/-. Post 1/-.
"Caley" steam packing $\frac{1}{16}$ rnd. 1½d. foot.
$\frac{1}{8}$ rnd. 3d. $\frac{1}{4}$ square 7d. foot.

PATTERNMAKING **CASTING** **MACHINING**

NO CATALOGUE MEANTIME S.A.E. ENQUIRIES

CALEDONIA MODEL CO.
5 PITT STREET GLASGOW C 2
Corner of 468 Argyle Street

"No Quantity Too Small"

BRASS, COPPER, BRONZE, ALUMINIUM, LIGHT ALLOYS

IN

Rod, Bar, Sheet, Tube, Strip, Wire, Angle, Channel, Tee.

H. ROLLET & CO. LTD.
6, Chesham Place, London, S.W.1
SLOane 3463

Works:
32-36, Rosebery Avenue, London, E.C.1

BRANCHES AT
Liverpool Manchester Birmingham Leeds

Permanent Magnets in action

Picking up tacks
. . . or any small particles is easy for the handyman who uses an "Eclipse" Button Magnet. Simply assembled in any thin non-ferrous cover which allows withdrawal of the magnet from the holding face. *Ask your tool dealer for literature showing many other uses.*
Eclipse
PERMANENT MAGNETS

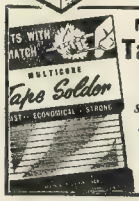
Made by James Neill & Company (Sheffield) Limited *and obtainable from all tool distributors*

PM45

Home Soldering MADE SIMPLE WITH

Multicore Solder

Ersin Multicore Solder has five cores of extra-active Ersin Flux. The residue is non-corrosive and has a high insulation value. Ersin Multicore Solder is therefore recommended for all electrical connections and work where a guaranteed non-corrosive flux is required. Arax Multicore Solder has two cores of Arax flux the residue of which is acid free in a dry state but which can absorb moisture and become mildly acidic. Although the residue of Arax flux is considerably less corrosive than most paste or liquid fluxes, it should be removed with water if the work is to be painted or plated. Arax Multicore will solder almost all difficult metals (including nickel, stainless steel, etc.) except aluminium. Both Ersin and Arax Multicore Solders are available in 5/- and 6d. cartons. In addition, Ersin Multicore Solder is now also supplied in the new Home Constructors 2/6 Pack.



MULTICORE Tape Solder
Melts with a match. Needs no soldering iron, no flux, no special skill. On cards.
1/- EACH

Bib WIRE STRIPPER AND CUTTER
Strips insulation without nicking wires. Cuts wire cleanly. Splits plastic extruded twin flex. Adjustable to most wire thicknesses.
3/6 EACH

MULTICORE SOLDERS LTD.
MULTICORE WORKS, HEMEL HEMPSTEAD, HERTS. (BOXMOOR 5656)

The ANNUAL SUBSCRIPTION to

MODEL ENGINEER

Published every Thursday, it is obtainable from local newsagents or direct from the Publishers by subscription.

(U.S.A. & Canada $8.50) **58/6** post free

Percival Marshall & Co. Ltd · 19-20 Noel St · W1

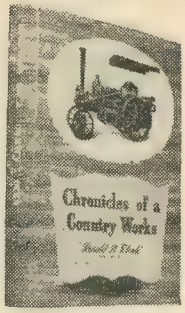
RANGEFINDERS for EXPERIMENTERS

Contains a host of optical equipment including two mounted Achro object glasses F.L. 11¼ in., dia. 29 mm.—Pentag. Prisms, narrow angle prism—intricate centre prism combination, prismatic window, $\frac{5}{8}$ in. Ramsden eyepiece, etc. A wonderful "buy" for the telescope maker. Cost over £150.

55/- CARRIAGE FREE U.K.

CHARLES FRANK
67-73 SALTMARKET, GLASGOW, C.1.
'Phone Bell 2106/7 *Established 1907*

STEAM ENGINE BOOKS



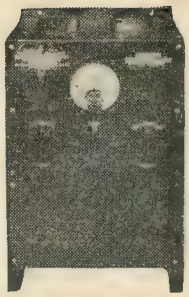
CHRONICLES OF A COUNTRY WORKS, *by Ronald H. Clark, A.M.I.Mech.E.* The story of "Burrells of Thetford." The growth and development of this world famous family business which was responsible for making the first portable engine (in 1848) and the first heavy duty steam road haulage engine (in 1856). This notable book gives details of almost every Burrell engine ever made—and there are nearly 4,000 of them. There is also a very fine collection of drawings and old prints. 328 pages, 167 plates and figures. 63s., post 1s. (U.S.A. and Canada $12.50, post paid).

STEAM ENGINE BUILDERS OF SUFFOLK, ESSEX AND CAMBRIDGESHIRE *by Ronald H. Clark.* A history of the steam engine trade in the counties of Cambridgeshire, Essex and Suffolk lavishly illustrated with 100 photographs and drawings. The author carried out considerable research among a large number of firms to obtain data on all the various types and makes built during the past 150 years. Illustrations range from old prints salvaged from ancient catalogues to photographs of the latest modern machines, and there are numerous anecdotes, stories, adventures and data contributed by engine drivers, draughtsmen, directors and proprietors of the firms concerned. 141 pages. 6s. 6d., post 8d. (U.S.A. and Canada $1.75, post paid).

STEAM ENGINE BUILDERS OF LINCOLNSHIRE *by Ronald H. Clark.* A companion volume to *Steam Engine Builders of Suffolk, Essex and Cambridgeshire.* This book represents the history of thirty engineering companies in Lincolnshire, recording the vicissitudes of the firms and their founders and describing the characteristics of numerous types of engine, including many unusual designs. A feature of the book are the numerous illustrations, which, where possible, are the original catalogue blocks or reproductions of them. 150 pages, 141 illustrations. 12s. 6d., post 1s. (U.S.A. and Canada $3.00, post paid).

From your bookseller or

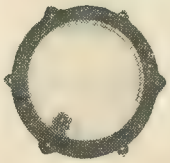
PERCIVAL MARSHALL, 19-20, Noel Street, W.1



BATTERY CHARGERS

Ideal for charging 24 volt batteries on electrically propelled vehicles.
RATING 22 volt, 10 amps., controlled by two four-position rotary switches for fine and coarse control which enables 6/24 volt batteries to be charged. Input 200/250 volt, a.c., 50-cy., fused for a.c. and d.c. Brand new, £17 10s., cge. 15/-.

GEARED MOTORS for the model maker, small & very powerful, 12/24 volt D.C., 4/8 r.p.m. 35/- post 2/6. Will work from 230 volt A.C. mains with our transformer and rectifier 17/- extra.



BULKHEAD FITTING. 9 in. diam., flat tripod type, suitable for lamps up to 100 watt, complete with pushbar switch lampholder. Ideal for farm buildings, garages, greenhouses, etc. Brand new, 17/6, post 2/6.

VACUUM PUMPS. Ex R.A.F., brand new, 7 cu. ft. per min. 10 lb. per sq. in. at 1,200 r.p.m. Rotary vane type. 22/6 each, post 2/9.

CROSS POINTER METERS with two separate 100 microamp movements. Brand new, 22/6, post 2/-.

CHARTBOARDS. With pantograph arm, perspex scale, protractor head, as used in the R.A.F. for navigation purposes, 17 in. square. Brand new, will make a useful drawing board. 25/-, post 3/-.

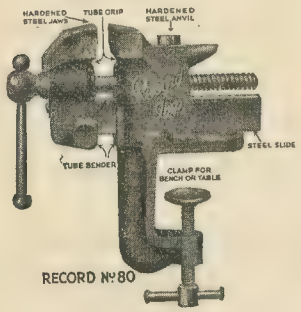
VENTAXIA FANS. Extraction or intake. 230/250 volt A.C., 6" Blades 130/-, post 3/-.

VOLTMETERS. 0/300 A.C. 2½" flush round 25/-, post 1/6.

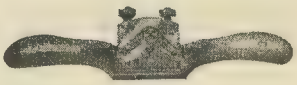
L. WILKINSON (CROYDON) LTD.
19, LANSDOWNE ROAD CROYDON

RECORD TOOLS

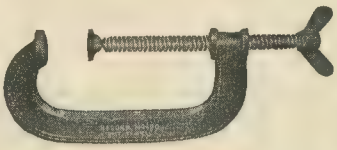
FOR MODEL ENGINEERING.....

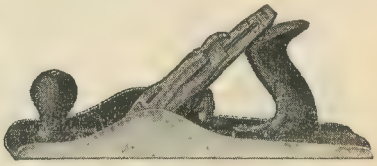


RECORD № 80



OBTAINABLE FROM YOUR USUAL TOOL DEALER





★ *the widest range to choose from*

★ *The full range of RECORD TOOLS includes, Vices, Cramps, Spokeshaves, Bolt Cutters, Tripod Stands, Sheet Metal Cutters, Pipe Tools and over 60 different types and sizes of Planes.*

Fully descriptive 156 page Pocket Catalogue Free of charge on Request to Dept. M.E.

Made in England by C. & J. Hampton, Limited, Sheffield

Model Engineer

Classified Advertisements together with remittance should be sent to Model Engineer, 19/20, Noel Street, London, W.1, by latest Thursday morning prior to date of publication. Advertisements will be accepted from recognised sources by telephone. GERRARD 8811. Ex. 4

CLASSIFIED ADVERTISEMENTS

★ Private: 3d. per word. Trade: 6d. per word. Minimum 12 words. Use of box 1s. 0d. extra.

★ Rates for displayed advertising in this section. Trade 35s., Staff 45s. per single column inch. Column width 1⅞ in.)

The Advertisement Manager reserves the right to refuse or suspend advertisements without giving any reason. Every care is taken to avoid mistakes, but the publishers cannot be held liable in any way for printing errors or omissions. Receipt of "copy" for publication implies acceptance of these conditions by the advertiser. Whilst every care is taken to exclude advertisements from doubtful sources, no responsibility can be accepted by the publishers for the bona fides of advertisers.

WORKSHOP EQUIPMENT

Buck & Ryan for Lathes and Workshop Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661.

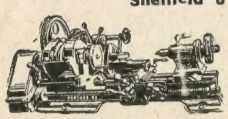
Genuine Offers. Tinman's jenny, strong good condition, £3 10s New wiring machine, 4 pairs rollers, 2 closing, £15. Edwards 21" tinman's bending rolls bench machine as new, £15.—S. PLUMBLEY, Station Road, Freshwater, I.O.W.

Wanted. ½" motorised bench drill. 6" or 8" double ended grinder, 240/50/1.—POYSER, Peck's Hill, Mansfield. Phone: 148.

Immediate Delivery from Stock, Myford "ML7" and "Super 7" lathes, Super Adept lathes, bench planers, shapers, electric motors, small tools.—F. W. KUBACH, 12, Sylvan Road, London, S.E.19. LIV 3311-12.

Lathes (motorised). Ace 7" × 42" s.s. and s.c., gap, £69. Sheldon 5" fitted Norton gearbox, £95. Atlas 5" bench type s.s. and s.c. reconditioned, £58. Littlejohn 5" s.s. and s.c., two chucks, £95. Wilson 7½" all-geared gap bed, s.s. and s.c., £275. Hobson 5½" all-geared on cabinet, reconditioned, £115. Terms.—VICTA ENGINEERING CO., Maidenhead. Phone: 50.

CHARLES PORTASS & SON
Buttermere Works, Sheffield 8



Lathes Chucks Counter-
Motors Tools Shaft

"E.W." 2½" × 10" Convertible Lathe. We can now arrange delivery of this much sought after lathe. All accessories from stock. S.A.E. lists and illustrated leaflet.—WANSTEAD SUPPLY CO., 30, The Broadway, Woodford Green, Essex.

New Eagle surface grinders, £185. Marlow vertical milling machines, 28" × 8", £235.—VICTA ENGINEERING CO., Maidenhead, Phone: 50.

S.C.B.G. 3½" Lathe, chucks, accessories, tools, £12 o.n.o. Details—101, Knightsdale Road, Weymouth.

Brazing Lamps, 5 pt. ex-govt., used G.C. with pressure gauge, 45s. each.—H. GUTHRIE, Crossgate Hall, Dalkeith, Scotland.

£35 Pools Special 4" × 16" Bench Lathe, 3-jaw, 4-jaw, drill chuck, vertical slide, hollow mandrel, backgear, screwcutting, tumbler reverse, DTI.—2, Isabella Road, Homerton, London, E.9.

Wimet Tipped Lathe Tools in ¼", 5/16" and ⅜" square, sets of 12, £2 15s. ½" square, £3 5s., cash or c.o.d. New ML7 and Super 7 lathes. Your old lathes taken in part exchange. Send details of what you wish to turn in. Used lathe list, 1s.—CORBETT'S (LATHES), Stanton Hill, Sutton-in-Ashfield.

Pittler B2 Lathe, treadle, stand, 22 collets, three s.c. chucks, independent chuck, drill chuck, faceplates, dividing head, screwcutting. Incomplete castings to complete overhead drive, excellent condition, £50. Starrett 12" Vernier gauge, new, £7 10s. 4½" × 36" wood-turning lathe, treadle, stand, slide and tee rests, £10. Evenings—SWANNELL, 54, Corney Road, Chiswick, London, W.4.

Wanted. Beginner requires 4½" to 3½" s.c. chuck, reasonable condition and price.—BAXTER, 32, Hale Road, Altrincham, Cheshire.

Stuart-Turner No. 12 water pump as new, £7. Hoover ¼ h.p. double ended, 230/1/50, 2,850 r.p.m. motor, £7. Another, 240/1/50, 950 r.p.m., £7. Brand new Black and Decker 0-¼" Utility electric drill, £5 5s. 32 volt, 6 amp d.c. generator, 1,500 r.p.m., £5.—Box No. 8657, MODEL ENGINEER Offices.

Near New Portass model "S" lathe, 3 chucks, faceplate, centres, countershaft unit, £20.—Box No. 8658, MODEL ENGINEER Offices.

Barker 5½" Centre Lathe for sale, complete with tools, 4-jaw and self centring chucks. As new seen working, cost £200, accept £95 o.n.o.—Phone BER 2273/5.

Precision Lathe, 3½" heavyduty Cromwell with built-in countershaft, etc. Combined "V" and flat bed. Push-button "Stop-Start." Automatic feed to saddle and cross slide, bed gap, screwcutting, back geared, dials on all feedscrews, 360 deg. swivelling top slide, motorised, leadscrew 4 t.p.i., complete set of change wheels for screwcutting and automatic feed. Three jaw and four jaw chucks. Set of collets with drawbar, index plate, saddle stop, etc. Complete on heavy stand, £60. Buyer collects.—HORNE, 13, Hollydene, Beckenham Lane, Bromley, Kent.

Tailstock and Set change wheels for 4½" Southbend lathe.—34, Winterslow Drive, Havant, Hants.

Mail Order. New bargains, 1s. extra post under £1. Dies 1/8" 40 t.p.i., 5/32", 3/16", 7/32", ¼", 3s. 4d. each. Taps, 40 t.p.i., 5/32", 3/16", 7/32", ¼", 2s. each. Hand bench drilling machine, ½" chuck 2-speeds, £5 10s. Burnerd independent chucks 4", 72s., 4½", 75s., 6", £6 4s. 6d. Self centring 4", £9 0s. 3d. Machine vices, 18s. 6d. Precision drill chucks ½" No. 1 M.T., 43s. No. 2, 44s. Wood chisels set ¼", ⅜", ½", ⅝", 1", 16s. Expanding wood bits, ½"-1½", 14s., ¾"-3", 19s. Stillson wrenches 6", 4s. 6d., 8", 6s., 10", 7s. 6d. Hand drills ¼", 10s. Breast ½", 27s. 6d. Drill chucks ½" No. 1 or No. 2 M.T., 11s. 6d. Superior, 18s. 3d. Lathe centres No. 1 M.T., 4s. 7d., No. 2 M.T., 6s. 6d., No. 3 M.T., 8s. 6d. H.S. tool bits, ¼", 1s. 6d., 5/16", 1s. 11d., ⅜", 2s. 3d. Sets H.S. drills No. 1-60, 50s. H.S. drills 29 different 1/16"-½", 70s. H.S. A-Z, 57s. Stands with each set. Micrometers, 1", 10s. Drill Grinding Jig to ½", 37s.—S. GRIMSHAW, 7, Hall Street, Manchester 18. Warehouse: Gorton Lane.

3½" Grayson B.G.S.C. ¼ h.p., 250-50c. motor 4-jaw ind., 3-jaw s.c., faceplate, catchplate, change wheels, no stand. Buyer collects, £30, no offers.—E. WILLIAMS, "The Nest," Cockerham, near Lancaster.

£7, Super Adept Lathe and accessories, including 4-jaw independent chuck.—6, Birch Close, West Weybridge. WEY 5257.

Adept No. 2 Shaper, power driven less motor, complete on stand, £19 10s.—TAYLOR, Holly Bank, Yatton, Bristol. Tel. 3332.

MODELS AND FITTINGS

Traction Engine Wanted, model to 3'. Write airmail to—ORLANDS CORNELL, Sidney, New York.

2½" Freelance 4-6-4 Tank, coalfired, commended M.E. Exhibition 1934, mechanical lubricator, Walschaerts. Slight repairs needed, has hauled 27 stone, £25. 3½" Caledonian 4-4-0 chassis, wheels, cylinders, and drive, also tender, chassis and wheels completed. Valve gear, tender bogie frames, brake rigging, nearly complete. Boiler requires brazing, sundry parts under construction, some drawings, £25. And various micrometers, £1 each.—KIRBY. Phone: RAV 0637.

10¼" Equipment. Two all steel boilers, new with regulators, two sets of cylinders, piston valve, new, complete set of wheels for the above, also drawings. These parts for "Royal Scot" or similar, the lot £175.—26, Hog Hill Road, Romford, Essex.

L.N.E.R. 2" Scale passenger coaches (four) less bogies, £12 10s. each.—SMITH, 77, Devonshire Road, Morecambe, Lancs.

New Synchronome master electric clock, complete set of finished parts for sale (particulars), silvered dial Invar pendulum rod, extra dial movement, oak case, £20. —As below.

Robinson hot air engine, 4½" bore cylinder, very good working condition, collection necessary, £14.—DEWHURST, Riverside House, Reedham, Norwich.

Traction Engine, complete model wanted, state price and particulars to—BARROS, 223, Queens Drive, Liverpool, 15.

Wanted to Purchase, Hire or borrow plans of M/sailer "Girl Pat." A set of plans was once published by Scottish Modelcraft. All letters answered.—Box No. 8661, MODEL ENGINEER Offices.

30 c.c. Two Stroke racing engine castings, detailed prints, 50s. set. Disc or clapper valve.—Box No. 8656, MODEL ENGINEER Offices.

6′ Wooden Hull, copper horizontal boiler, single cylinder link reversing engine, feed pump, water tank, piping and brass paddles. The above need certain work but would make up into a powerful model, £10 the lot, carriage extra. Also "Railway Mechanical Engineering," vols. 1 and 2, £2. —C. ARNOLD, 8, Homestead Way, Northampton.

L.M.S. Duchess, castings and drawings for cup winning locomotive and other 3½" gauge locomotives. "Princess" driving wheels. S.A.E.—JACKSON, 13, Glebe Avenue, Acomb, York.

Sale. 1¼" Scale Traction Engine parts, £20. Set of castings for 1¼" scale Fowler compound traction engine, £12 10s. Catalogues, Foster, Fowler, Wallis & Steevens, Fodens steam wagon. Book, "Steam Road Vehicles," 1917 Ed. Offers. Castings for Juliet, 3½", £5.—S. P. CRAGG, 36, Flamsteed Road, Strelley Est., Notts.

Sale. 3½" Gauge "Juliet" new, engineer-built, maker of six successful locomotives, good puller, bargain, £35.—HARRISON, 18, Wyberton West Road, Boston.

CATALOGUES

Tool & Materials ... ... 9d.
L.B.S.C. Blueprint & Castings ... 1/-
Refunded on first 20/- order.

HANDRAIL KNOBS

"O" Gauge ... ... 2/9 doz.
1 in. ,, ... 3/- ,,
2½ in. ,, ... 3/3 ,,
3½ in. ,, ... 3/9 ,,
5 in. ,, ... 4/3 ,,

Overseas orders a speciality.

KENNION BROS. LTD.,
2, Railway Place, Hertford. *Phone* 2573

ELECTRICAL

A.C. Motors Self Start, induction 200/250 volts, 50 cycles, 1 phase, 1,425 r.p.m., ¼ h.p., £4 2s. 6d., 1/3 h.p., £4 19s. 6d., ½ h.p., £6 15s. Perfect and guaranteed. Carriage extra.—JOHNSON ENGINEERING COMPANY, 319, Kennington Road, S.E.11. Reliance 1412/3.

Barford Steam Raiser 1949, electrically heated, 15 lb. pressure, 3-phase, 400 volt, 15 kw, in good condition; redundant, disconnected, buyer removes. Can be inspected Hyning Home Farm, Carnforth; any reasonable offer accepted.—DONALD SCOTT, Hyning Estate Office, Yealand Conyers, Carnforth.

GENERAL

Air Compressors, tanks and accessories at far below list, from £5 17s. 6d., TV and lighting generator from £15.—TEDDINGTON ENGINEERING CO. LTD., 29-31, High Street, Teddington, Middx. Tel.: Kingston 1193.

Spraying Handbook, 3s. 10d., post free. Paints, cellulose and allied spraying sundries. Catalogue, 3d.—LEONARD BROOKS, 25, Oak Road, Harold Wood, Romford.

Guaranteed! Easy Home Constructed Refrigeration. Genuine domestic components. Not secondhand ice cream scrap. Modern hermetic G.E.C. units, gas, electric and oil silent unit. Everything for refrigeration. Complete specialists. Send s.a.e. for free illustrated "Sealed system" leaflet or 1s. for complete catalogue (refunded with first order).—BRAID BROS., 50, Birchwood Avenue, Hackbridge, Surrey. Phone: Wallington 9309.

Compressors for Sale. Twin piston with tank, 2½ cu. ft. per min., £4. Single cyl., £2. All types motors. S.A.E. for list. —WHEELHOUSE, 13, Bell Road, Hounslow. Phone: HOU 3501.

Build Your Own Refrigerator. Everything to make built-in or cabinet refrigerator. S.A.E. for sealed unit list and schematic diagram or 1s. (refundable) for 32 page catalogue including details of free 4 cu. ft. cabinet diagram offer. Hire purchase available.—WHEELHOUSE, 13, Bell Road, Hounslow. 'Phone HOU 3501.

Work Wanted. Turning, capstan milling, grinding, shaping. Fully equipped works in heart of London. Single or long runs.—BELL & SMART, 48-50, Tottenham Street, W.1.

Watch and Clock Repairs, cleaning machines, staking tools, etc. (Large illustrated catalogue and price list, 4s. 6d.) Easy payment terms available.—JOHN MORRIS (CLERKENWELL) LTD., 64, Clerkenwell Road, London, E.C.1. (Best prices paid for used watches.)

Learn It As You Do It.—We provide practical equipment combined with instruction in radio, television, electricity, mechanics, chemistry, photography, etc. Write for full details to—E.M.I. INSTITUTES, Dept. ME47, London, W.4.

Unowot Whiston's Sell. S.A.E. catalogue.—K. R. WHISTON (Dept. M.E.S.), New Mills, Stockport.

Aqualung and compressor equipment.—PRYCE, 157, Malden Road, Cheam.

Watches, any make repaired (with guarantee), post confidently to—YOUNG & SON, 133, London Road, Chippenham, Wilts.

Wanted. Antique Weapons, pistols, revolvers, blunderbusses, daggers, gunpowder flasks, bullet moulds, etc.—DENNIS, 28, Langley Road, Slough.

Light Precision Turning, Fitting and Assembly Work Wanted. Production, experimental or prototype and complete mechanisms. Prompt delivery, moderate charges.—CANONBURY ENGINEERING CO., 283, Essex Road, London, N.1. CAN 6256.

Wanted. Plain Precision Bench Lathe 2½" to 4" centres. Particulars to—MOORE, 11, Gordon Terrace, Southbourne, Emsworth, Hants.

For Sale. About 1,400 M.E.s 1907-50, some vols. complete. Offers to—Box No. 8659, MODEL ENGINEER Offices.

Model Engineers, approx. 1,250 copies, 1930 to date, few missing, all clean. Buyer collects, S.W. London, £12.—Box No. 8660, MODEL ENGINEER Offices.

Will Exchange. What Have You? Bardon & Oliver 1¼" plain turret lathe. Power feed to 6-station turret. 7½" s.c. chuck. 1¼" bar feed collet chuck. Cone drive. Write—27, Saxon Road, East Ham, London, E.6.

The Smaller the Model you are building, the more valuable is the "Agrippa" non-magnetic, self-releasing screw grip. Removes and replaces the smallest screw in the most awkward place like a flash. 3" size, 3s. 6d. From—ELLEMSEE (LMC) ACCESSORIES, Wheaton Avenue, Leeds 15.

Model Engineer **SUBSCRIPTION FORM**

Overseas readers may experience difficulty in obtaining Model Engineer. To become an annual subscriber send an International Money Order for 58s. 6d. sterling ($8.50 in U.S.A. and Canada) with the completed form below.

Please send a copy of Model Engineer each week to:

Name .....
(Block letters please)

Address .....

.....

enclose *valued* 58s. 6d. ($8.50) *to cover subscription for one year (52 issues). This includes postage.*

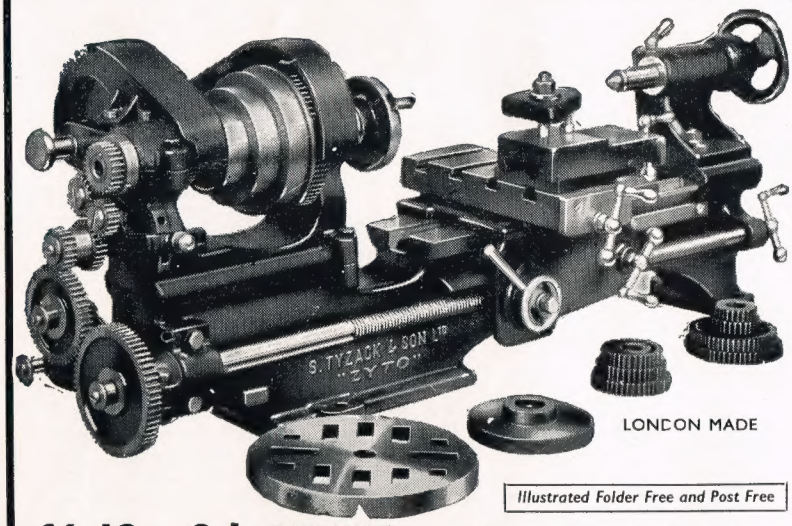
Post this form to

MODEL ENGINEER · 19-20 NOEL ST · LONDON W1

Printed in Great Britain for the Proprietors by ELECTRICAL PRESS LTD., Cordwallis Works, Maidenhead, Berks, and published by PERCIVAL MARSHALL & CO. LTD., 19-20, Noel Street, London, W.1.
Registered for transmission by Magazine Post to Canada including Newfoundland.

ME QUERY COUPON OCTOBER 1957

"ZYTO" 3⅜" BACK GEARED, SCREWCUTTING, TURNING, SURFACING LATHE



LONDON MADE

" THE FINEST LATHE VALUE "

- ★ 12½" BETWEEN CENTRES
- ★ FULL COMPOUND SLIDE REST
- ★ HOLLOW & SET OVER TAILSTOCK
- ★ TUMBLER REVERSE
- ★ CALIBRATED SLIDES, ETC.

A few unsolicited testimonials taken ta random from hundreds received.

" You deserve congratulations for turning out such a fine machine."
J.T., Edmonton, LONDON.

" I consider the Zyto Lathe I have is a very nice job. Detail and finish is very good; it is a lovely machine."
N.K., Wisbech, CAMBS.

" I am pleased to report that after an extended test, the Zyto Lathe you supplied is O.K. in all respects."
D. P., Yeovil, SOMERSET.

" The Zyto 3⅜ in. Lathe is an excellent and sturdy job. I am very pleased with it."
W. R., NEWBIGGIN-BY-SEA.

" Re our Zyto 3⅜ in. Lathe, we must congratulate you on a very nice job."
H. B. and C. R., Belfast, N. IRELAND.

Illustrated Folder Free and Post Free

£6 12s. 0d. DEPOSIT
Balance 8 monthly payments of 74s. 4d.

Cash Price £33 0s. 0d.
* Includes Gear and Pulley Guards, full set change wheels and standard equipment *

S. TYZACK & SON LTD 341-345 OLD ST., LONDON, E.C.1 Tel.: SHOREDITCH 8301 (ten lines)

CONDOR SLICED

FOR QUALITY
FOR FLAVOUR
FOR AROMA
FOR CUT
FOR FRESHNESS

It's a Gallaher Tobacco

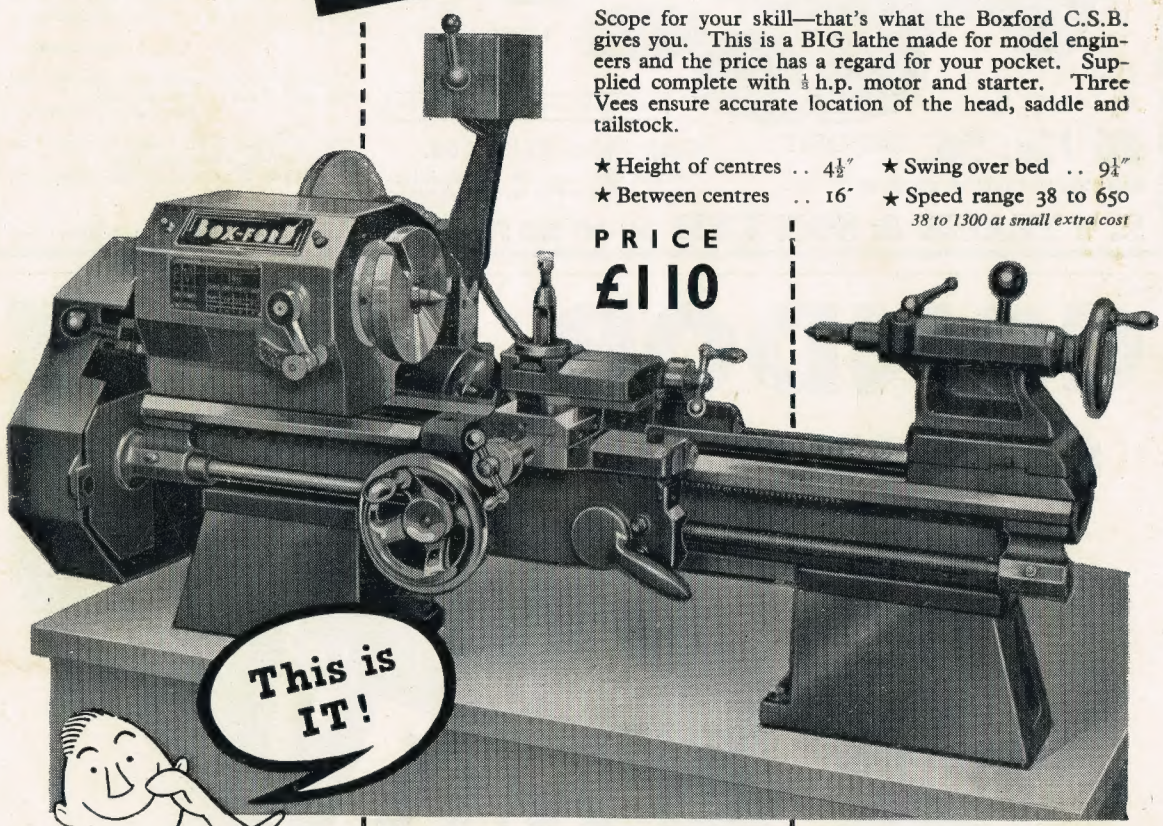
Looking for a small lathe ??

With big features . . .

Scope for your skill—that's what the Boxford C.S.B. gives you. This is a BIG lathe made for model engineers and the price has a regard for your pocket. Supplied complete with ⅓ h.p. motor and starter. Three Vees ensure accurate location of the head, saddle and tailstock.

★ Height of centres .. 4½″ ★ Swing over bed .. 9¼″
★ Between centres .. 16″ ★ Speed range 38 to 650
38 to 1300 at small extra cost

PRICE £110



Model C.S.B.

BOX·FORD

4½″ CENTRE LATHE

Send for fully detailed leaflet TODAY!

DENFORDS ENGINEERING CO. LTD.
HECKMONDWIKE YORKSHIRE